5.1 Mendelian Genetics

**Genetics** is the study of __________________________. It studies the mechanisms by which ____________ are passed between parents and offspring.

The principles of genetics were determined by __________________________ (1860s). Most of his research came from studying inheritance in __________________________.

**Characteristics (traits) of peas studied by Mendel**

<table>
<thead>
<tr>
<th>Character</th>
<th>Dominant trait</th>
<th>Recessive trait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed shape</td>
<td>Spherical</td>
<td>Wrinkled</td>
</tr>
<tr>
<td>Seed color</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Flower color</td>
<td>Purple</td>
<td>White</td>
</tr>
<tr>
<td>Pod shape</td>
<td>Inflated</td>
<td>Constricted</td>
</tr>
<tr>
<td>Pod color</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Flower position</td>
<td>Axial</td>
<td>Terminal</td>
</tr>
<tr>
<td>Stem height</td>
<td>Tall</td>
<td>Dwarf</td>
</tr>
</tbody>
</table>

**Alleles**

All traits are coded for in the ______________ of an individual. The area on the DNA that codes for a particular trait is called a ________________.

From the diagram above, you may notice that for every trait listed, there are 2 different versions.

These different versions of a gene are called ______________________

* e.g. for flower colour, there are 2 alleles – purple and white

Each individual receives ______________ alleles for every trait – one from the ______________ and one from the ______________

The combination of alleles that is inherited determines what characteristics an individual shows.
**Dominant trait**- is always expressed, if present. It masks a recessive trait, if the recessive trait was also inherited in an individual

Dominant allele (P - purple flowered pea plant)

a. homozygous dominant

b. heterozygous dominant

**Recessive trait** –

In order for an individual to express the recessive form of a trait, they must inherit ______ alleles for the recessive trait from it’s parents.

Recessive allele (p – white flowered pea plant)

To show white flowers, the plant must have be ____________________________ (___).

A **genotype** is the ____________________________ that an individual inherits from its parents.

It is usually written as a __________________ code, where a capital letter represents the ________________ form of the allele, and a lower case represents the ________________ form of the allele.

PP –

Pp –

pp –

Based on the genotype and the type of inheritance, the individual will exhibit certain characteristics. This is called their _______________________.

PP –

Pp –

pp –

**Note:** a ____________________________ and a ____________________________ individual both exhibit the same phenotype, even though their genotypes are different.
Monohybrid Cross

A monohybrid cross allows an experimenter to make a prediction about the possible outcomes that can arise from crossing 2 individuals of known genotype.

To do this, a ______________________ can be used to show how alleles in parents ____________ (in meiosis) to create ________________, and then how these gametes potentially combine in ________________.

- The experiment tracks the inheritance of a single trait.
- Mendel’s “_________________________”
  a. pairs of genes separate during gamete formation (meiosis).
  b. the fusion of gametes at fertilization pairs genes once again.

Law of Segregation

Example: Cross between two homozygotes for purple flowers (PP) and white flowers (pp)
Mendel’s Parental (P) generation

Mendel took 2 ____________________________ plants showing opposing characteristics (purple flowered pea plant and white flowered pea plant), and crossed them.

This is known as the ___ generation.

Punnett Square for the P generation

Mendel then crosses 2 individuals from the F1 generation

Mendel took 2 purple plants that he produced from crossing the P generation (2 F1 generation plants), and crossed them.

Pp  x Pp

The phenotypic ratio of this cross (a cross between 2 heterozygous parents) is known as the ________________________________.