

Heredity & Genetics - CP Biology

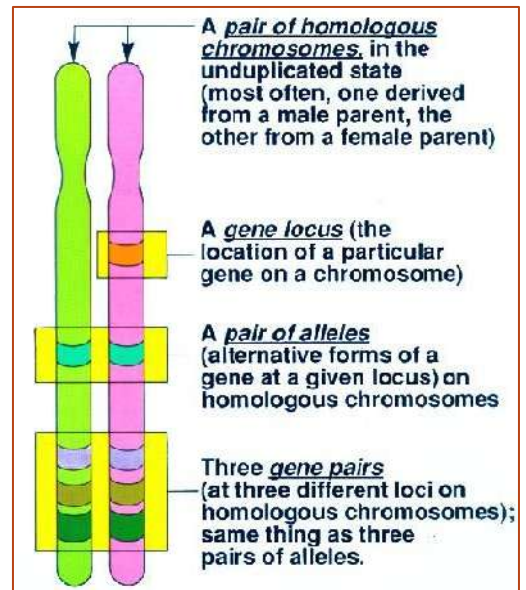
What is heredity?

1. _____, or inheritance, is the passing down of something from one generation to the next.

- We inherit our _____ from our parents.
 - Traits include: _____

2. _____ is the science of heredity.

- Recall that our chromosomes come in pairs called _____.
- Each homologous pair contains one _____ (inherited from mom) and one _____ (inherited from dad)
- Homologous chromosomes contain the same genes, but may have _____ of some genes.
- Different versions of the same gene are called _____.
- For example, you may inherit the allele for freckles from your mother, but the allele for no freckle from your father.
 - Sometimes one allele is completely _____ over another.
 - Freckles are a dominant trait, so even with just 1 allele for freckles, you will have freckles.
 - The other allele is called _____.
 - You need to have _____ in order to have the recessive trait.



Genotypes & Phenotypes

1. The combination of alleles that you have for a certain trait can be written as 2 letters called a _____

- A dominant allele is written as a _____, and a recessive allele is written as a _____.
- The allele for freckles is written as _____, and the allele for no freckles is written as _____.

2. The physical trait that results from a certain genotype is called a _____

- Freckles are a dominant phenotype, and no freckles is a recessive phenotype

3. If you have 2 of the same allele, it is called a _____ genotype

- Homozygous dominant: 2 capital letters
 - _____ - you will have freckles
- Homozygous recessive: 2 lowercase letters
 - _____ - you will not have freckles
- If you have 2 different alleles, it is called a _____ genotype
 - _____ - you will have freckles, because you only need _____ to have the dominant phenotype!

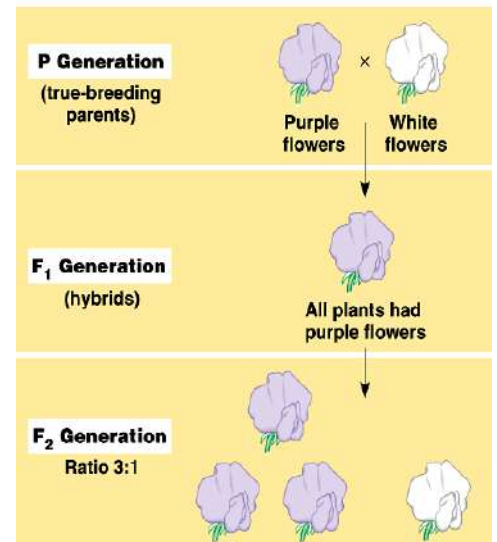
Origin of Genetics

- _____ is considered to be the father of modern genetics.
 - He was a monk who studied heredity in _____.
 - Pea plants are ideal for studying heredity because:
 - _____
 - _____
 - _____
- Pea plants normally _____
 - The pollen from one flower _____ the seeds of the same flower.
 - After many generations, the offspring still have the same traits as the parent plants.
 - These are called _____ plants – they are _____ (can be dominant or recessive)
- Mendel _____ pure pea plants with opposite characteristics
 - Used pollen from purple flowers to pollinate plants with white flowers, and vice versa
 - In both cases, _____
 - When these purple offspring plants were allowed to self-pollinate, they produced both purple-flowered and white-flowered plants in a _____.

- The first plants that are crossed are called the _____ (P) generation. These are the **pure (true-breeding) plants**.

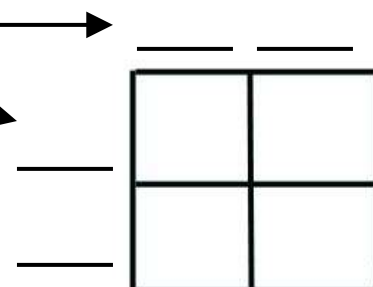
The offspring of a parental cross are the _____ (F₁) generation. These plants are called **hybrids** and all exhibit the _____,

The offspring of the F₁ plants are the _____.
There are 3 dominant phenotypes for every 1 _____



Predicting Genotypes and Phenotypes

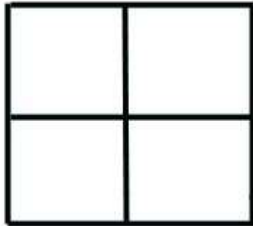
- _____ are the tool we use to predict the genotypes and phenotypes in the offspring of a given set of parents.
 - The genotype of one parent goes across the top
 - The genotype of the other parent goes down the side
 - The parent genotypes are crossed to determine the possible genotypes of the offspring.



2. Punnett square practice:

A) Mendel first crossed pure purple-flowered plants with pure white-flowered plants.

- i) What was the genotype of the purple-flowered plants? _____
- ii) What was the genotype of the white-flowered plants? _____
- iii) Use the Punnett square to determine the genotypes of the F1 generation:



- How many offspring are homozygous recessive? _____
- How many offspring are homozygous dominant? _____
- How many offspring are heterozygous? _____
- What are the phenotypes of these offspring?

B) Mendel then crossed two of the F1 plants.

- i) Use the Punnett square to determine the genotypes of the F2 generation:



- How many offspring are homozygous recessive? _____
- How many offspring are homozygous dominant? _____
- How many offspring are heterozygous? _____
- What are the phenotypes of these offspring?

3. When 2 heterozygous organisms are crossed, we expect:

- _____
- _____

4. When working with Punnett squares, we are dealing with _____.

















- The actual results we see may not _____ what the Punnett square predicts
- The _____ the number of offspring, the more closely the actual results match what is predicted.

5. Mendel's _____ states that during gamete formation (meiosis), allele pairs separate (segregate), and _____

- To test this hypothesis, he crossed a heterozygous plant with a homozygous recessive plant.
- He predicted that there would be a _____ of purple to white plants.
 - Make a Punnett square to test his prediction.
 - Was Mendel right? _____
- This principle can also be used to figure out if an organism is _____ or _____ for a dominant trait

6. The principle of _____:

- Traits are inherited independently of one another.
- This can be shown by a two-trait cross
- When both parents are heterozygous for both traits, it is called a _____
 - In this example, both parents are RrYy
 - R = _____ seeds
 - r = _____ seeds
 - Y = _____ seeds
 - y = _____ seeds
 - All possible combinations of alleles must be written on the outside of the Punnett square

| | | | | |
|----|--|--|--|--|
| | RY | Ry | rY | ry |
| RY | RRYY  | RRYy  | RrYY  | RrYy  |
| Ry | RRYy  | RRyy  | RrYy  | Rryy  |
| rY | RrYY  | RrYy  | rrYY  | rrYy  |
| ry | RrYy  | Rryy  | rrYy  | rryy  |

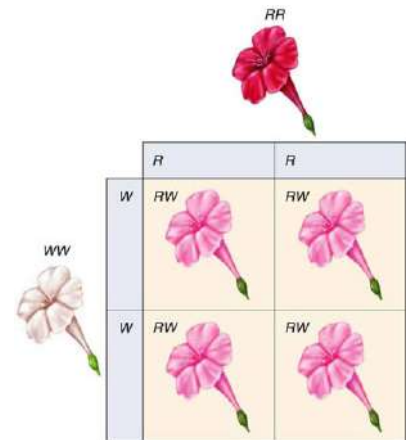
In the F1 generation:

- How many round, yellow seeds are there? _____
- How many round, green seeds are there? _____
- How many wrinkled, yellow seeds are there? _____
- How many wrinkled, green seeds are there? _____
 - The phenotype ratio of a dihybrid cross is always _____

Many Genes Do Not Have One Allele That Is Completely Dominant

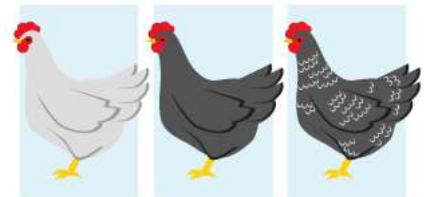
1. In _____, the heterozygous phenotype is _____ between the two alleles.

- Ex: Some flowering plants have an allele for _____ flowers and an allele for _____ flowers. Plants that have one of each allele will have _____.
- Since neither allele is _____, they are both written as _____ letters.



2. In _____, neither allele is dominant, and organisms that are heterozygous will express _____ equally

- Ex: A species of chicken has an allele for _____ feathers and an allele for _____ feathers. Chickens that have one of each allele will have _____ (NOT gray feathers, as you would expect in incomplete dominance).



| | | | |
|-----------|-------|-------|----------|
| Phenotype | WHITE | BLACK | SPECKLED |
| Genotype | WW | BB | BW |

- As in incomplete dominance, both alleles are written as capital letters.

Multiple Alleles

1. There may be more than 2 possible alleles for a trait.

- Ex: Human _____
- 3 possible alleles: I^A, I^B, and i
 - _____ is _____
 - _____ and _____ are _____

| Genotype | Phenotype (Blood Type) |
|----------|------------------------|
| | |
| | |
| | |
| | |

The Chromosome Theory of Heredity

1. In the early 1900s, _____ proposed the chromosome theory of heredity:

- _____

2. This theory was confirmed by _____, who discovered the X and Y chromosomes while studying fruit flies!

- X and Y chromosomes are called _____
 - Females: _____
 - Males: _____
- All other chromosomes are called _____ (22 pairs in humans)

Sex-Linked Inheritance

1. The X and Y chromosomes contain other genes besides the ones that determine sex.

2. The X chromosome is _____ and contains _____ than the Y chromosome.

- A male needs only _____ sex-linked allele to have the recessive phenotype.

3. Sex-linked alleles are written as _____ on the X chromosome; the Y chromosome gets no superscript.

- Ex: Eye color in fruit flies – Red eye allele (dominant): _____ White eye allele (recessive): _____
 - Red-eyed females can be _____ or _____
 - White-eyed females must be _____
 - Red-eyed males must be _____
 - White-eyed males must be _____

Many Traits Are Determined By More Than One Gene

1. A _____ is a single trait that is determined by _____

- Results in _____ - the possibility of _____
_____ from one extreme to another

2. _____ affect the expression of other genes

- Ex: Human eye color – a base color of either _____ (B) or _____ (b) is determined by one gene, but modifier genes can give people eyes that are green, hazel, gray, etc.