2009

|  |
| --- |
| Note Packet |  |



![basic flower anatomy (equal length) [blank]]()**Section 1: A History**

|  |  |
| --- | --- |
|  |  Genetics |

When starting a new unit, it is best to begin at the beginning. Genetics began with…

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: known as the “**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.”

* Came from a poor family, but excelled in school, so the family found a way to send him to *‘higher education.’* Gregor eventually became a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (for various reasons, the educated poor generally took this route in life back in this time period).
* He was **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** a super famous scientist. He was a high school science teacher.
* He smoked a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, so his fellow monks encouraged him to spend his time outside. He became the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** for the monastery.
* He began to notice different varieties of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**in the garden and decided to *‘experiment’* with them.
* His experiments showed that a plant’s characteristics are passed on to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in a very **\_\_\_\_\_\_\_\_\_\_\_\_\_\_e** manner. If you know exactly what traits a plant has, you can predict what its offspring will look like. This was **REVOLUTIONARY** for its time.
* The scientific community **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** his work because he *“oversimplified an obviously complex mechanism.”*
* He and his work were totally **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** *(meaning no one even knew his name)* for the next 34 years. Three independent scientists discovered the paper Mendel wrote. These scientists all had the same results that Mendel did; too bad, he had died by this time and never knew what an impact he would have on the future.

Because of Mendel, we now have two new vocabulary words:

**Heredity**: the passing of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** from **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**Genetics**: the study of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part II. Prequel Flashback -- Plant Anatomy**

Before we can talk about Mendel’s experiment, we need to know a little about flower anatomy...

These are the main parts of a flower:

**Sepal**: This is a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** leaf found where the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** meet. You can think of this as a left-over from when the flower was a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (it was the outer layer of the bud)

**Petal**: This is the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** part of a flower.

*Reproductive Parts:*

Male Parts (**Stamen**):

**Filament**: This is a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** stalk that the anther sits upon.

**Anther**: This produces the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of a plant.

Female Parts (**Pistil**):

**Stigma**: The Pistil is usually shaped like a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. If this is so, the Stigma is the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** at the **\_\_\_\_\_\_\_\_\_\_\_\_**.

**Style**: This is the long **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the vase. It **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the Stigma to the Ovary.

**Ovary**: This is where **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**occurs. The ovary will eventually develop into a **\_\_\_\_\_\_\_**.

**A complete flower has \_\_\_\_\_\_\_\_\_\_\_\_\_\_ male & female parts.**

**Sepal**

**Petal**

**Ovary**

**Anther**

**Filament**

**Style**

**Stigma**

How A Plant Is Fertilized

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** grains are produced in the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. Pollen grains contain the plant’s sperm cells. These grains are either blown about by the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or moved from one flower to another by **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

When a pollen grain lands on a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** it grows a long tube that extends down to the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. The sperm cells move to the ovary and fertilization occurs. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** form inside the ovary that will eventually grow into a new plant. The ovary normally develops into a structure that will protect the seed and help it get established (a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_)**.

If the pollen that fertilizes a flower came from the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** flower it is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**-Fertilization. If the pollen that fertilizes a flower comes from a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**flower it is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**-Fertilization.

A flower that would favor Cross-Fertilization:

![basic flower anatomy (short stamen) [blank]]()Why would this flower be most likely to cross-fertilize?

A flower that would favor Self-Fertilization:

Why would this flower be most likely to self-fertilize?

![basic flower anatomy (long stamen) [blank]]()

Mendel’s Pea Plants were the type of flower that normally self-fertilize. For his experiment, he wanted to control what pollen fertilized a particular flower.

**Part III. Back to the Experiment**

The first thing Mendel wanted to discover was why some of the pea plants were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and some were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

* First he Self-Pollinated **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants and noticed that he always got **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants as a result. At the same time he Self-Pollinated **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants and similarly always got **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants as a result.
	+ He called these plants “**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**” because they **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** produced the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** type of offspring.
		- Next, he decided to cross-pollinate **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** traits. He **crossed** a short purebred with a tall purebred. He called these the Parents (**P**).
			* *What do you think happened?*

 Short x Tall =

* Mendel named the next generation of pea plants the First **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (*“son” in Latin)* or **F1.**
	+ The F1 generation of pea plants were **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**!
		- This, of course, made him wonder where the *“shortness”* went. He crossed **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants from his F1 generation to make an **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** generation.
			* The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** trait came back in the F2 generation! He produced 3 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** plants for every 1 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** one. This ratio can be written:

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** time he performed this experiment the short trait always disappeared in the F1 generation, but reappeared in the F2 in the **same** ratio! There was definitely something going on here, and it was not random.



Mendel decided to test other traits that he noticed in his pea plants. Mendel tested **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** traits in all and always got the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** results!

Mendel eventually developed an explanation for his results.

* He said that there must be some **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of a parent plant that gets passed on to the offspring and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** what the offspring looks like. He called this a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* He decided that different **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of one gene must exist and called them **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. (in this case there was Tall & Short)
* He hypothesized that **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** parents donate their version of the gene, but that one type of allele can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the other. He named these different versions of alleles **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** & **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.



* Mendel developed a technique to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** what the offspring will be. It is called a **\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_**.

He coded the genes & alleles using the following pattern:

He assigned the gene a letter. The dominant version got the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**version of the letter. The recessive version uses the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**version.

 Example. **T** = **\_\_\_\_\_\_** **t** = **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**T**

**T**

**t**

**t**

P1

|  |  |
| --- | --- |
|  **Tt** |  **Tt** |
|  **Tt** |  **Tt** |

1st Cross

**\_\_\_\_** = Purebred pea plant for the **Tall** Allele. Since **both** alleles are the same this type of plant is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**\_\_\_\_**= Purebred pea plant for the **short** allele. This is also **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**TT x tt = Tt + Tt + Tt + Tt**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the offspring will have one of each allele!

* If an organism has **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** different **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** it is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

The next cross Mendel did was between two of the **F1** offspring.

**T**

**t**

**T**

**t**

F1

2nd Cross

|  |  |
| --- | --- |
|  **TT** |  **Tt** |
|  **Tt** |  **tt** |

The F2 generation looks a lot different from the F1.

You can describe an organism by its Genotype or Phenotype.

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: The actual combination of Alleles (**genetic**

makeup)

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: How the organism **\_\_\_\_\_\_\_\_\_\_** (or ‘ph’eels)

The F2 generation has 3 different **Genotypes**:

**TT** (**25%**) **T**t (**50%**) **tt** (**25%**)

The F2 generation has 2 different Phenotypes:

**Tall** (**75%**) **short** (**25%**) *This is a Ratio of 3:1*

 Gregor Mendel did many more crosses based on his ideas, including crosses dealing with **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** traits. For example, Tall, Yellow Pods, Wrinkled seeds X Short, green pods, round seeds. The Punnett squares get bigger, but the same basic theories on how the genes would move held true. The ratios he would predict would occur.

 Mendel did get VERY lucky though in his choice of the pea plant. Each one of these traits is found on a different chromosome, so none of them were linked to each other. If they had been, his data would

have been confusing.

**Section 2: Probability**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: the likelihood that a specific **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** will **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

There are 2 kinds of probability: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** & **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Let’s talk about a quarter:*

* What are the chances that it will be heads? **\_\_\_\_\_\_\_\_\_** or **\_\_\_\_\_\_**
* What are the chances that it will be tails? **\_\_\_\_\_\_\_\_\_** or **\_\_\_\_\_\_\_**
* What are the chances that it will land building side up? **\_\_\_\_** or **\_\_**
* What are the chances that it will be heads or tails? **\_\_\_\_\_\_\_\_\_** or **\_\_\_\_\_\_\_\_\_**



Remember, that is just a **\_\_\_\_\_\_\_\_\_** and is not absolute:

Flip a coin 10 times, what is the predicted ratio? **\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_**

* Did this happen?

But, the **\_\_\_\_\_\_\_\_\_** times you do it, the closer you should come to the mathematical probability. In science, the **\_\_\_\_\_\_\_\_\_** trials the **\_\_\_\_\_\_\_\_\_**! But, in reality, we don’t have the money or the time.

*Next question:*

* If a quarter has landed heads 9 times in a row, what are the chances that it will land tails on the 10th throw? **50%**
	+ Each flip is **\_\_\_\_\_\_\_\_\_** of the ones before it!

*New Scenario:*

* + - I have a bag that contains **\_\_\_\_\_\_\_\_\_ MARBLES** , **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** marbles, & **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** marbles.

What are the chances that:

* + - * I will pull a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** from the bag?

 **3**

**10**

Green Marbles = **3**

= **30%** or **.3**

Total Marbles = **10**

* + - * I will pull a Red Marble from the bag? **. \_\_\_\_\_\_\_\_\_\_\_\_\_\_**
			* I will pull a Purple Marble from the bag? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
			* I will pull a Blue marble from the bag? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
			* I will pull a Red or Green marble from the bag? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Okay, so how does this Genetics stuff actually work in cells?

During Mitosis all of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** condenses into **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** .

Every specie on Earth has a certain Number of Chromosomes:

**Humans**: **\_\_\_\_\_** pairs =

\_\_\_\_\_\_ Chromosomes

\_\_\_\_\_\_: 78 Chromosomes

Silkworms: **\_\_\_\_\_** Chromosomes

Onion: 16 Chromosomes

Fruit Fly: 8 Chromosomes

E. Coli bacteria: **\_\_\_\_\_** Chromosome

**\_\_\_\_\_\_\_\_**: 32 Chromosomes

A **Karyotype** is a picture of all an organisms Chromosomes lined up in pairs.

The number of Chromosomes you have has **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to do with how **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** you are.



When your body packs the chromatin into chromosomes, each section of DNA codes for a different gene. These **\_\_\_\_\_\_\_\_\_\_\_** can be seen in your chromosomes. The **\_\_\_\_\_\_\_\_\_** area of each pairing chromosome represents the **\_\_\_\_\_\_\_\_** gene, but could be different **\_\_\_\_\_\_\_\_\_** because one came from your **\_\_\_\_\_\_\_\_** while the other came from your **father**!

**T**

**t**

**Y**

**y**

r

r

**If these were two chromosomes from one of Mendel’s pea plants…**

What would the genotype be for height?

What would the phenotype be for height?

What would phenotype be for seed color?

What would the genotype be for seed shape?

What would the phenotype be for seed shape?

You have two types of cells in your body

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Cells: any **body** cell that has an **entire** set of Chromosomes.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Cells: a cell used in **fertilization** that has **½** the normal number of chromosomes. (**sperm** & **egg**)

Sex cells are created through a process known as **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a type of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** that creates cells with **½** the original number of chromosomes.

When two sex cells come together (**sperm** + **egg**) a process happens called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

During fertilization, the chromosomes in **\_\_\_\_\_\_** sex cell combine to create a **\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_** set of chromosomes. This one cell then goes through a complex series of **\_\_\_\_\_\_\_\_\_\_** divisions (guided by the **\_\_\_\_\_\_\_\_**) until it creates a new complete organism that **\_\_\_\_\_\_\_\_** traits from **\_\_\_\_\_\_\_\_** parents.

*Look familiar?*

*So, to Recap:*

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is found in the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and is made from **\_\_\_\_\_\_** base pairs.
* Specific sequences of DNA are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* Chromatin (DNA) condenses into **Chromosomes** before **Meiosis**.
* Each Chromosome contains **1000’s** of genes.
* These chromosomes are **split** and recombined to **create** a new organism.
* This new organism is made of up **½** of each parent’s genes.
	+ So, a particular gene could be traced back through a **family tree**.
	+ Or, a Doctor could give you the **probability** of you passing certain traits to your **offspring**.

**Section 3: Mutations**

Okay, first, to set some facts straight (and kill some fairy tales):

* Mutations **\_\_\_\_\_\_\_\_\_\_\_**caused by things called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* Mutations will **not** turn **pets** into Teanage Mutant Ninja Turtles.
* Nor will mutations create people will **\_\_\_\_\_\_\_\_\_\_\_\_\_** for **\_\_\_\_\_\_** like in **X-MEN**.
* A **\_\_\_\_\_\_\_\_\_\_\_\_\_** is any **\_\_\_\_\_\_\_\_\_\_\_\_** that occurs in a **\_\_\_\_\_\_\_\_\_\_** or a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

If a mutation were to occur to a **\_\_\_\_\_\_\_\_\_\_** something like the following could happen:

A nitrogen base could be **deleted**.

ACGTGCAGTA ACGGCAGTA

What was deleted? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

A base could be **inserted.**

ACGTGCAGTA ACGTTGCAGTA

What was inserted? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Because of the way genes are read to make proteins, these types of mutations have **drastic** effects. Like a taking a gear out of a clock.

Or, a base could be **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

ACGTGCAGTA ACGCGCAGTA

What was switched? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part II. Effects of Mutations**

A mutation can have either a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** , **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** , **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** effect.

* + - This depends on what **\_\_\_\_\_\_\_\_\_\_\_\_** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the mutation happens in and the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** where the organism lives.

If the mutation happens in a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cell (like the sun can cause in a skin cell) then that mutation will only affect **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cell. If that cell were to divide, it would pass the mutation on but the effect is localized to a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** part of the body. This is no big deal since you are made of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of cells. It is very likely that the mutation will cause the cell to **\_\_\_\_\_\_** and the mutation will be **\_\_\_\_\_\_\_\_\_\_\_**. The only problem is when the mutation causes the cell to grow uncontrollably **\_\_\_\_\_\_\_\_\_\_**.

However, if the mutation happens in one of your **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cells the effect will be **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**! This is the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** copy of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** that you pass on to your offspring, so **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cell in your offspring will carry the mutation. For example, if one of your sex cells had a mutation that affected the skin’s ability to make **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. Your offspring might not be able to make skin color. This is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. Whenever you get **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, you will notice that the attendant covers you with a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** apron. One of the reasons is to keep the X-rays from causing mutations in your sex cells.

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** mutations **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the functions of the cell or body to the point where the cell with the mutation **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or the offspring will **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** form.
* Many mutations that do not cause termination will only have **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** affects that are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** noticeable by themselves.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** mutations actually cause a positive, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** affect

**So, the expression of the mutation is determined by what type of cell is mutated. But, the affect depends entirely on the environment.**

If a buffalo were born with white fur, its chance of living might be different from that of a buffalo with brown fur…

* If it lived in the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** would be able to pick it out of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. Any change that makes an organism **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** likely to reproduce is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* If the buffalo lived in a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, though, the white fur would **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** have **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** affect on the buffalo’s chance to reproduce, so it would be **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Therefore, the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** a mutation has on an organism depends on what **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** it happens in and what type of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the organism lives.

**Genetic Engineering**:

The process of isolating **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in one organism that perform a specific **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and putting those genes into **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** organism in hopes of them performing a similar action.

**There are many good uses for this:**

**Human** genes have been put into **Bacteria**

Scientists were able to put the human gene that makes **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** into the DNA of a bacteria. This bacteria now makes **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** even though it does not need it for any reason. This **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** can be harvested and given to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** so that they can live.

Genes from one **plant** have been given to another

* Genes from plants that live in **\_\_\_\_\_\_\_** areas (*cacti*) have been given to **\_\_\_\_\_\_\_\_\_\_** climate plants (*tomatoes*) so that they might live in drier areas. This is very important to people who live in **\_\_\_\_\_\_\_\_\_** areas such as parts of the Middle East or Africa.
* Genes from plants that create **\_\_\_\_\_\_\_\_\_\_** with lots of **\_\_\_\_\_\_\_\_\_\_\_\_** have been added to many other plants to make them **\_\_\_\_\_\_\_\_\_\_\_** for us.
* Plants have been made able to live in lower **\_\_\_\_\_\_\_\_\_\_\_** than normal & have also been made to resist **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** better than normal because of Genetic Engineering.

**Gene Therapy**

This is a very **\_\_\_\_\_\_\_\_\_\_\_\_** & experimental **\_\_\_\_\_\_\_\_\_\_\_\_** treatment where **\_\_\_\_\_\_\_\_\_\_\_\_\_** copies of genes are put into **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. These viruses normally **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** your cells for bad reasons, but in gene therapy they invade and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** genes with **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** ones.

**Part IV. Pedigrees**

A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is much like a Family **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. It shows births & marriages, but most importantly, it shows who **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** specific diseases & who **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the disease are.

**Pedigree I**



This pedigree shows marriages & kids. Notice that **\_\_\_\_\_\_\_\_** are **\_\_\_\_\_\_\_\_\_\_** & **\_\_\_\_\_\_\_\_\_\_\_** are **\_\_\_\_\_\_\_\_\_\_\_\_**.

**Pedigree II**



This pedigree shows **\_\_\_\_\_\_\_\_\_\_** generations in a family. The two **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** shapes represent members who have a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** genetic condition, such as Cystic Fibrosis. Note that the parents of the affected children are 1st **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. The chances of a recessive phenotype occurring **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** when close relatives produce offspring [inbreeding].

**Pedigree III**



This pedigree shows **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** generations in a family. This pedigree traces a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** genetic phenotype such as Huntington’s Disease.

See if you can answer the questions:

1. **How many children did the first parents have?** **\_\_\_\_\_\_\_\_**

2. **How many were boys & how many were girls?** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

3. **How many of the 2nd generation show Huntington’s Disease?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

4. **What is the chance of passing the disease off to offspring?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

5. **Would you have children if you knew you had the disease?**

**Pedigree IV**



Pedigree IV from the previous page traces Color Blindness through a family.

1. **How many generations are shown?** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

2. **What does the Half-colored circle mean?** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

3. **Which sex shows color blindness more than the other does?** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

4. **Do all Daughters of Males with color blindness have the allele?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Pedigree V**

This is the European Royal Pedigree tracing **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** through the Royalty.



**Part V. The Future**

**Should You Have Kids?**

When people get older, (**MUCH OLDER** than **YOU**) they begin to plan starting a family. Sometimes people know about disorders or genetic traits that have shown up in their family, others have no idea.

Having a child is a very important decision and needs to be done **responsibly**.

People who wish to know more about their family & their children can get information a couple of different ways:

**Genetic Counseling**

A pair of would-be parents would go see a Genetic Counselor. The counselor would use the family history, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, & punnett squares to determine the couple’s chances of having a baby with specific genetic disorders.

For instance, a couple’s family has a history of Cystic Fibrosis. First the counselor would test the couples DNA to determine if either of them were carriers for the Gene.

**What if the Man was a carrier, but the woman was not?**

* There would be **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** chance their children would have the disease, but there would be a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** chance that their child would be a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**What if they were both Carriers?**

* They would have a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** chance of an **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** child, a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** chance of having a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** chance of having a child with the **disorder**.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a process where doctors remove amniotic **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** from a pregnant mother to see the Karyotype of a baby’s **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. They can then look at the baby’s chromosomes.