

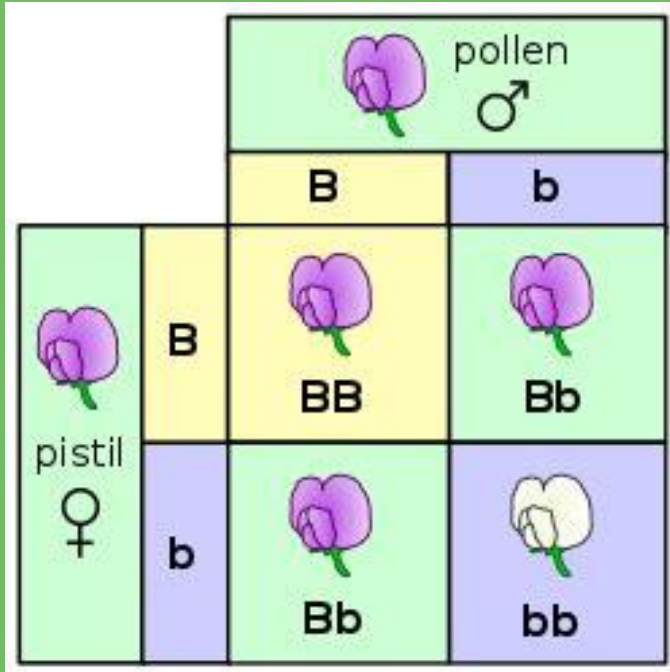
# ScienceCraft



## Genetics



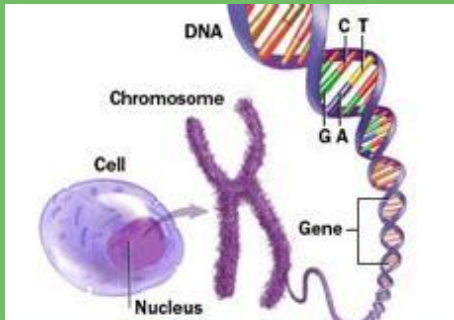
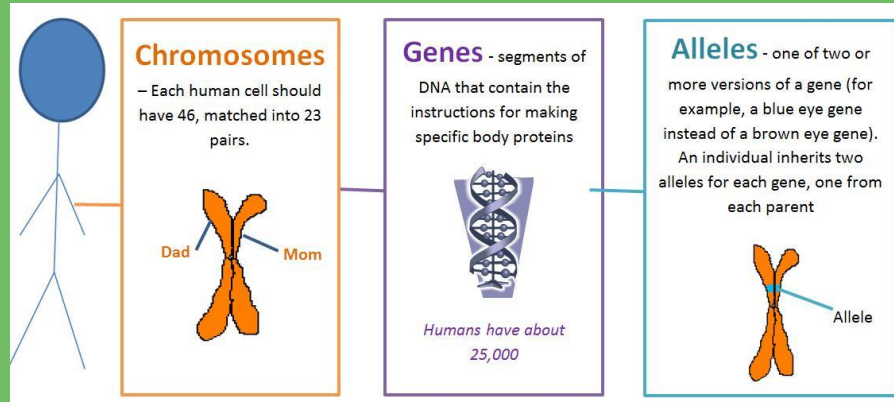
# What is Genetics?



- ✗ Genetics is the study of heredity, or how traits are passed from parents to offspring
- ✗ Genetics can explain why you look like your parents or family
- ✗ It is a subfield of biology. Geneticists can work as biomedical engineers, forensic scientists, and more!
- ✗ Today we'll be looking at how genes influence your traits



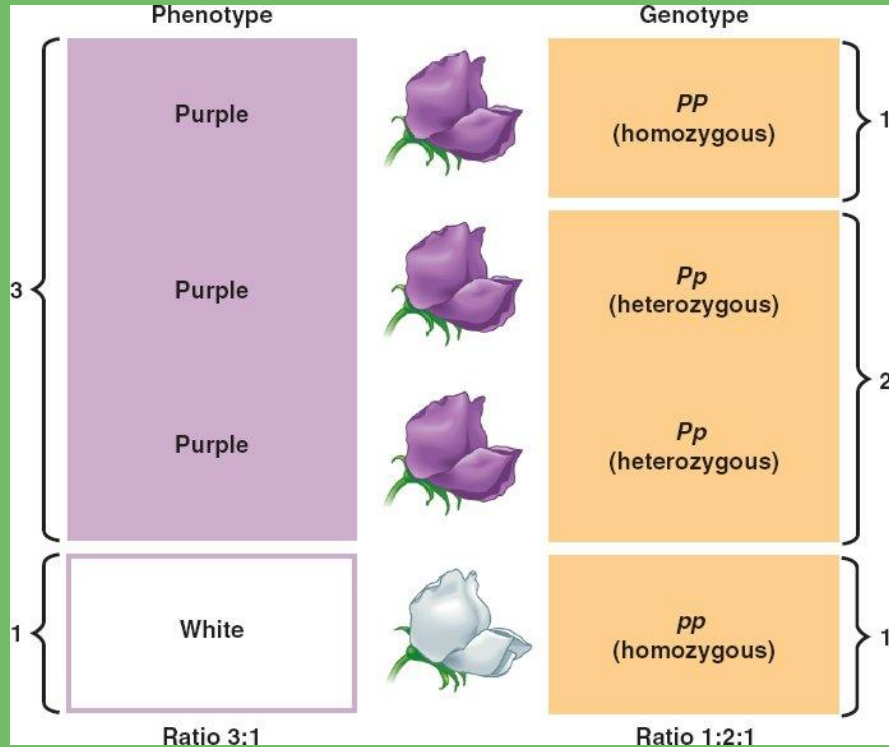
# At the molecular level



- ✗ Our traits: hair color, eye color, height, even parts of our personalities are determined by genes!
- ✗ Genes are parts of DNA molecules that tell your body to have a certain trait. DNA is coiled inside chromosomes
- ✗ You get 23 chromosomes from your mom and 23 from your dad. They each have many, many strands of DNA and thousands of genes



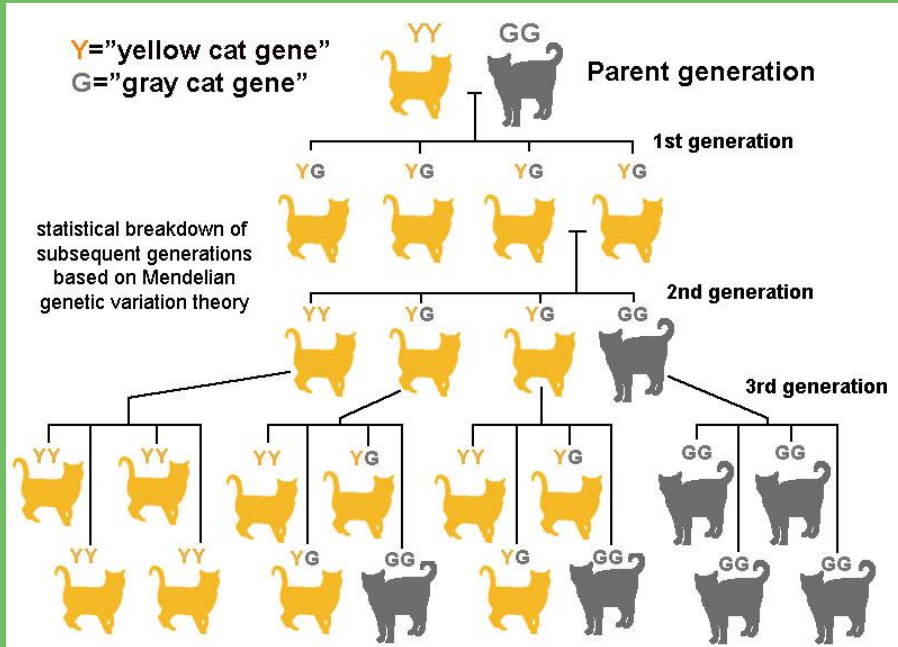
# What do genes do?



- ✗ Your specific genes, or “alleles”, are part of your genotype. Genotype is the genes that make a specific trait
- ✗ The trait itself is called a phenotype-- so red hair is a phenotype, and the allele that says “your hair is red, not brown,” is the genotype
- ✗ If your genotype has two of the same alleles, it's homozygous. If it has two different alleles, it's heterozygous.



# How are genes expressed?



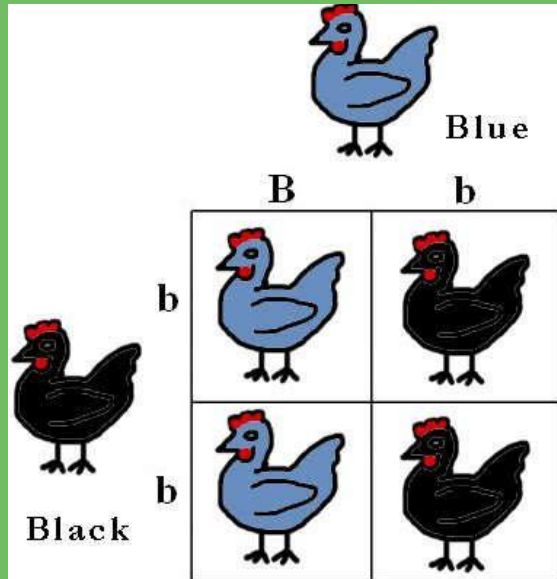
- ✗ Because you have two versions of most genes, one from your mom and one from your dad, only one can usually be expressed-- you can't be both tall and short
- ✗ If your genes from your parents are different, the one that determines what trait you get is dominant. In the picture, yellow fur is dominant.
- ✗ The other trait is called recessive and it only shows up when both of your parents gave you it



# Punnett Squares

Used to help solve genetics problems

	T	t
T	TT	Tt
t	Tt	tt



- ✗ Which parent is heterozygous? Is there a homozygous dominant baby bird?
- ✗ Punnett squares were developed to show the possibilities of the next generation's genotypes
- ✗ The parents' two alleles go on the top and sides, and the kids' go in the boxes
- ✗ Black birds have to be homozygous, but do blue birds?



# More Complicated Traits



Incomplete  
Dominance



Co-dominance

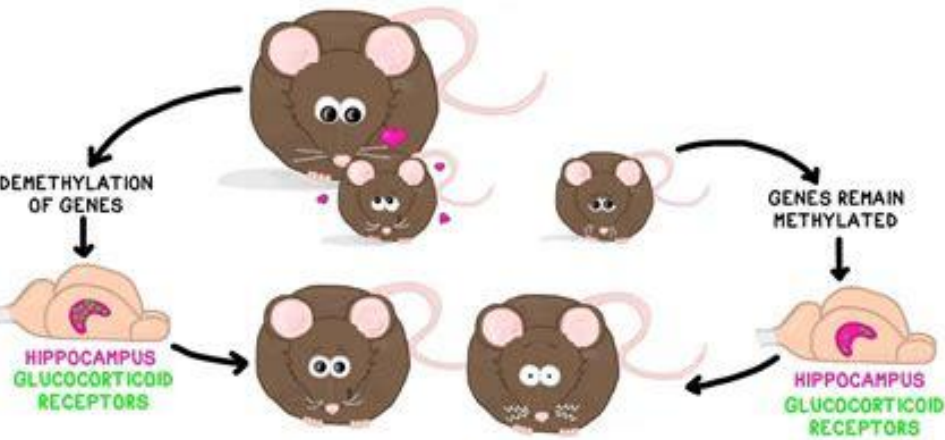


	YR	YR	YR	YR
yR	YyRr	YyRr	YyRr	YyRr
yR	YyRr	YyRr	YyRr	YyRr
yR	YyRr	YyRr	YyRr	YyRr
yR	YyRr	YyRr	YyRr	YyRr

- ✗ Mutation is when things don't go the way they're supposed to in your alleles. These can be positive, negative, or have no effect.
- ✗ Polygenic traits are traits that are controlled by multiple genes! They are on a spectrum, like eye color.
- ✗ Codominance is when both alleles are expressed, like AB blood.
- ✗ Incomplete dominance is when the dominant doesn't completely cover the recessive allele, like many polygenic traits.



# Epigenetics



- ✗ Epigenetics is “the study of heritable phenotype changes that do not involve alterations in the DNA sequence”
- ✗ Yes, your genes can (and do) change during your lifetime!
- ✗ Your DNA can never change, but the way that it is “tagged” chemically influences gene expression
- ✗ These chemical changes are why muscle cells look different from brain cells. More research ongoing!



In summary, genetics is the study of genes passed down from generation to generation. Genes are found in the DNA and make up your genotype. Your alleles can be heterozygous or homozygous and you can record them in a Punnett Square. There are other things that can impact gene expression, such as mutations, polygenic traits, codominance, incomplete dominance, and epigenetics. Any questions before the Kahoot?



