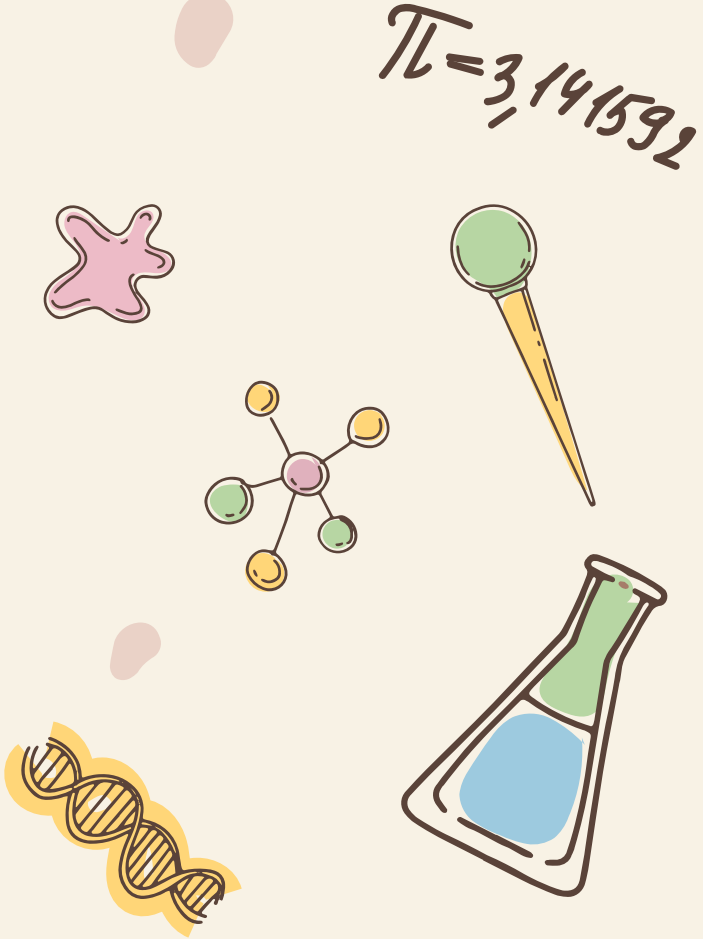
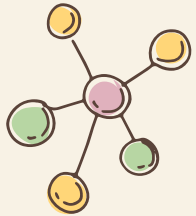
Science 10 - Biology

Science 10



Lesson Overview



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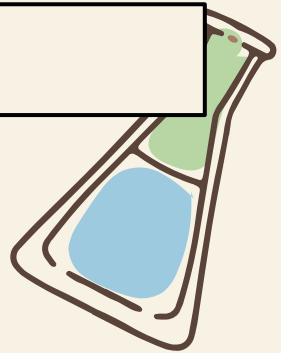
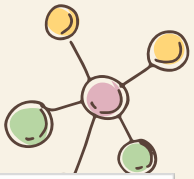
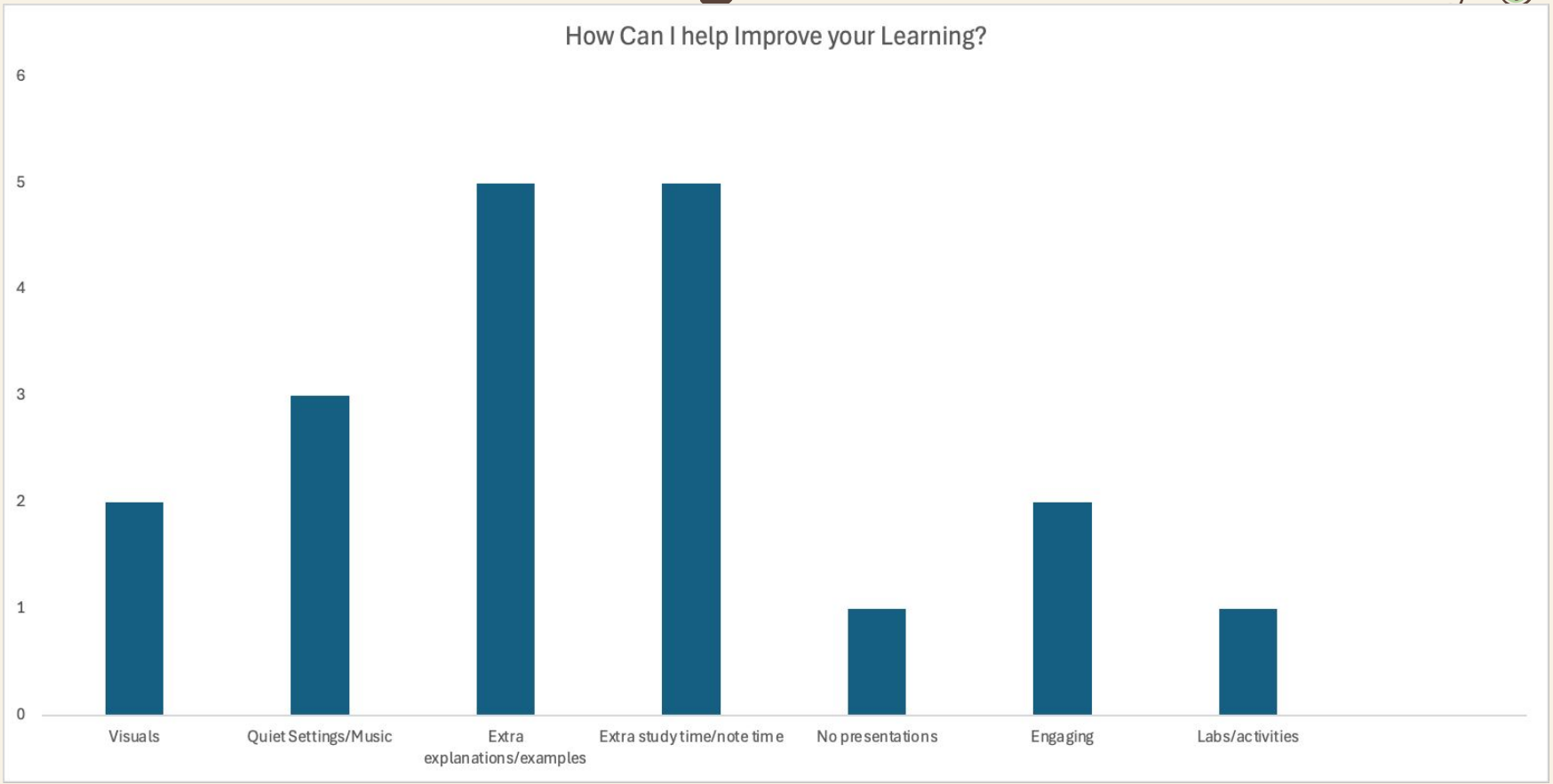
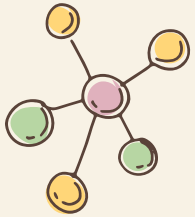


What Can I do to Improve your Learning: RESULTS!







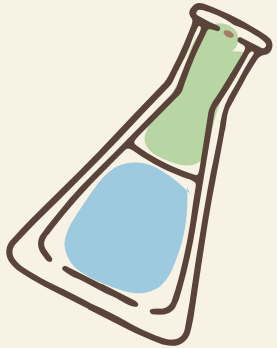
Brainstorm Activity

In groups of 2-3 think of any organism in the world that fits into any of these categories:

1. Largest
2. Smallest
3. Weirdest
4. Most important
5. Nicest looking
6. Scariest

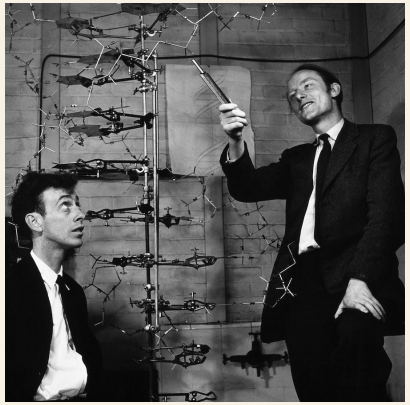
After everyone is done, will generate a class list.

What prompted you to pick these organisms for each category?

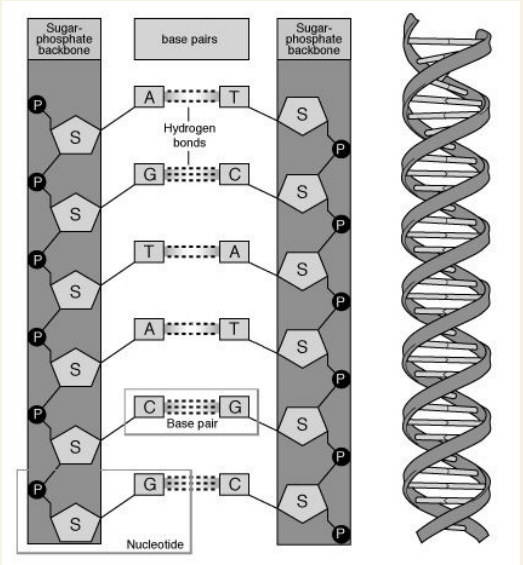


The DNA Molecule

Deoxyribonucleic Acid (DNA) is the molecule that encodes the **genetic instructions** used in the development and functioning of all known organisms.



The solution to the structure was described by **James Watson** and **Francis Crick** with help from **Rosalind Franklin** and earned them the nobel prize in 1953.



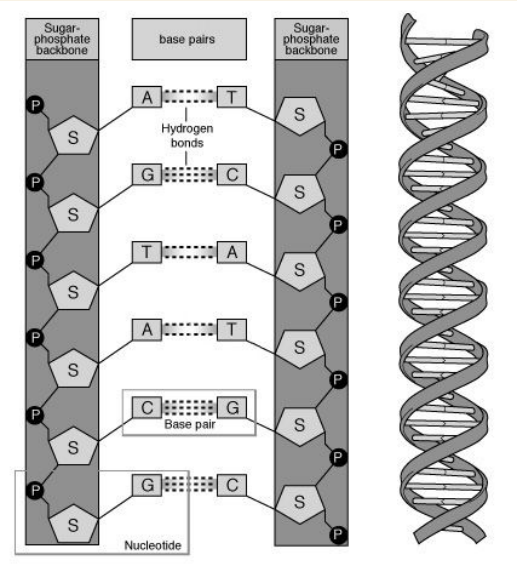
The DNA Molecule

The discovery of the structure of DNA!

https://www.youtube.com/watch?v=of_2Rq81hoI&t=3s

The DNA Molecule

Deoxyribonucleic Acid (DNA) is the molecule that encodes the genetic instructions used in the development and functioning of all known organisms.



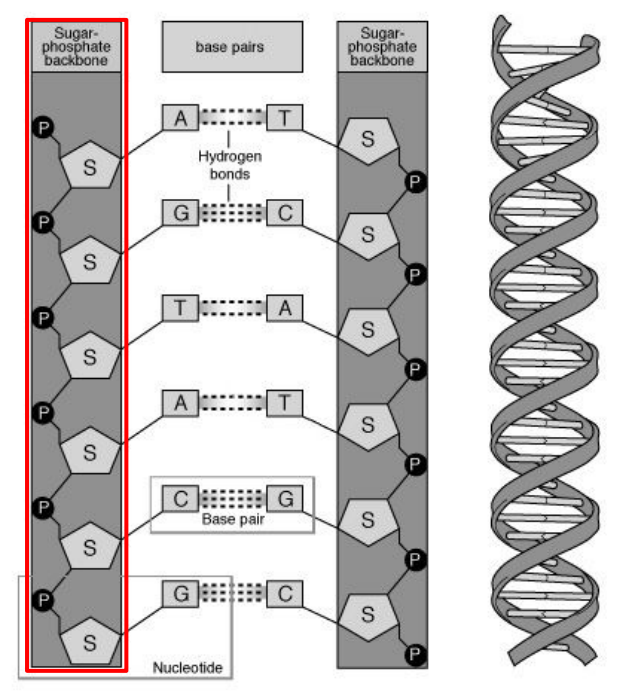
The information in DNA is stored as a "**code**" made up of **four** chemical "**nitrogenous**" **bases**: Adenine (**A**), Guanine (**G**), Cytosine (**C**) and Thymine (**T**).

- Adenine (**A**) always pairs with Thymine (**T**)
- Guanine (**G**) always pairs with Cytosine (**C**)

These form units called "**base pairs**".

The DNA Molecule

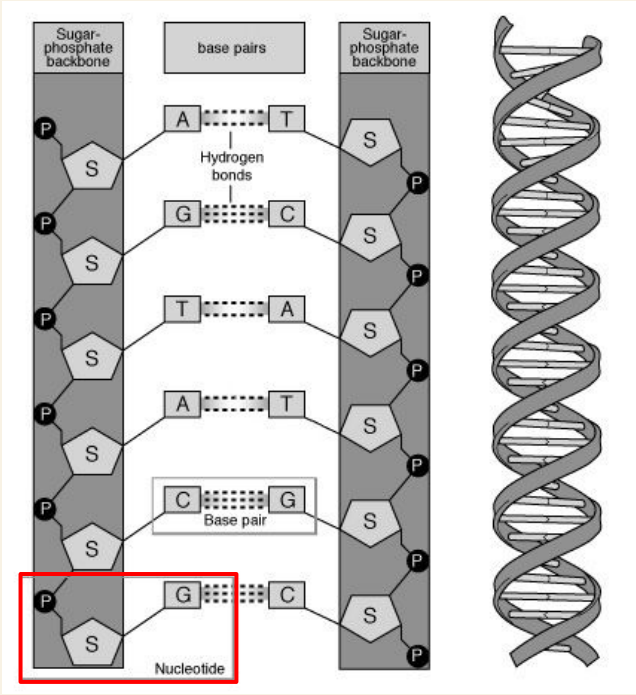
Each base is attached to a **sugar** molecule and a **phosphate** molecule. The sugar-phosphate molecules form the **backbone of the DNA**.



The DNA Molecule

Each base is attached to a **sugar** molecule and a **phosphate** molecule. The sugar-phosphate molecules form the **backbone of the DNA**.

A base, a sugar, and a phosphate group come together to form a **nucleotide.** Nucleotides are arranged in “strands” that come together to form the spiral structure of DNA called the **double helix.**



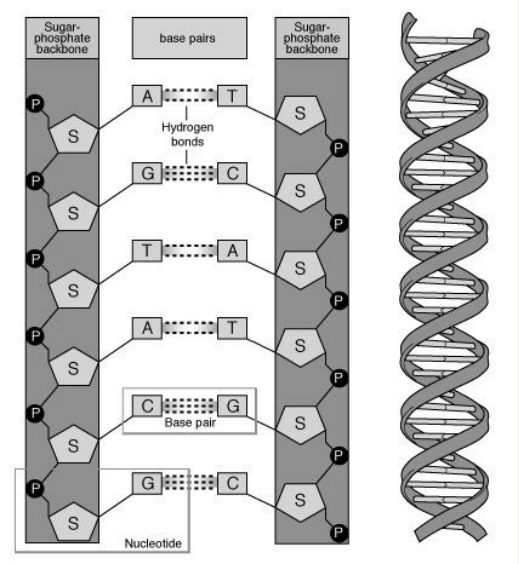
The DNA Molecule

https://www.youtube.com/watch?v=S9aWBbVypeU&t=1s

Function of DNA

DNA is the molecule that encodes the genetic instructions to make **proteins** which carry out vital functions in cells.

- The complete set of DNA is called a **genome.**
- The human genome contains **3 billion base pairs**, while a fern plant (*Tmesipteris oblanceolate*) has the largest known genome at **160 billion base pairs.**



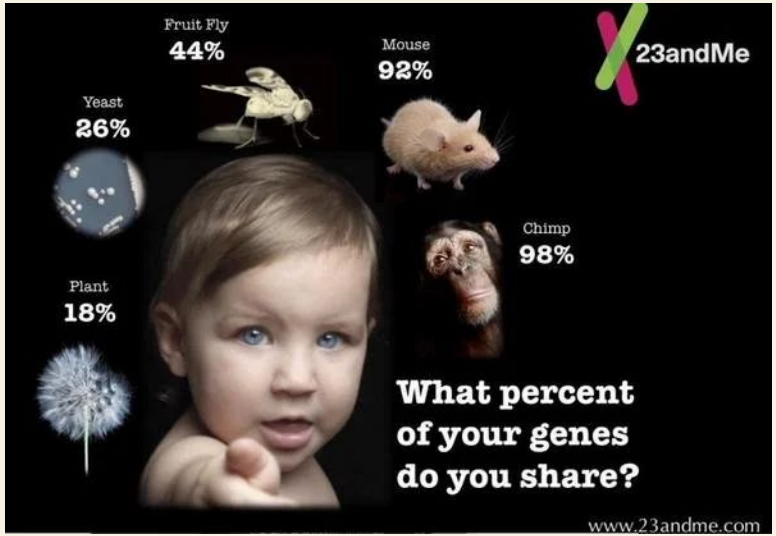
Do you think size of the genome contributes to complexity of an organism?

Function of DNA

Written out base pairs in DNA make a **sequence.**

E.g. A T A T C T C T T G A T G C G

- More than 99.9% of those bases are the same in all people.
- The order of the letters determines the information available similar to how the letters in the alphabet come together to form words and sentences.



Sequencing DNA

Sequencing DNA gives us a lot of information!

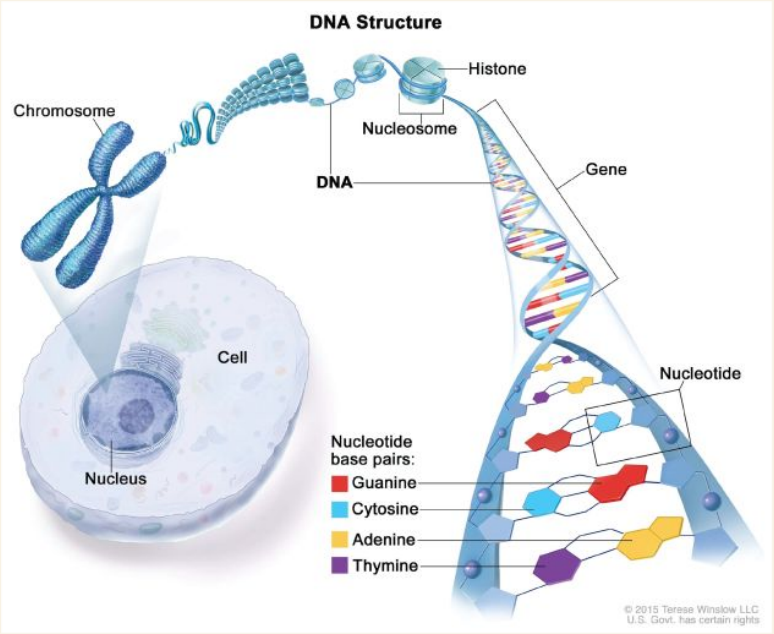
https://www.youtube.com/watch?v=UqC8aStX0ps&t=3s

Would you want to get your DNA sequenced?

How is DNA Stored?

Problem: How do we fit 2 meters worth of DNA into the nucleus of a cell (~5 micrometers - 10x smaller than the width of a piece of your hair)?

- In the nucleus, DNA is packaged into thread like structures called **chromatin**.
- Chromatin condenses further into another structure called **chromosomes**.



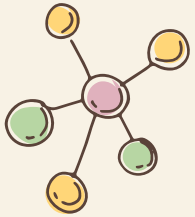
How is DNA Stored?

Question: Do you think that chromosome number relates to the complexity of the organism?

- Humans have a total of 23 pairs of chromosomes (46 total).

Chromosome count in different organisms

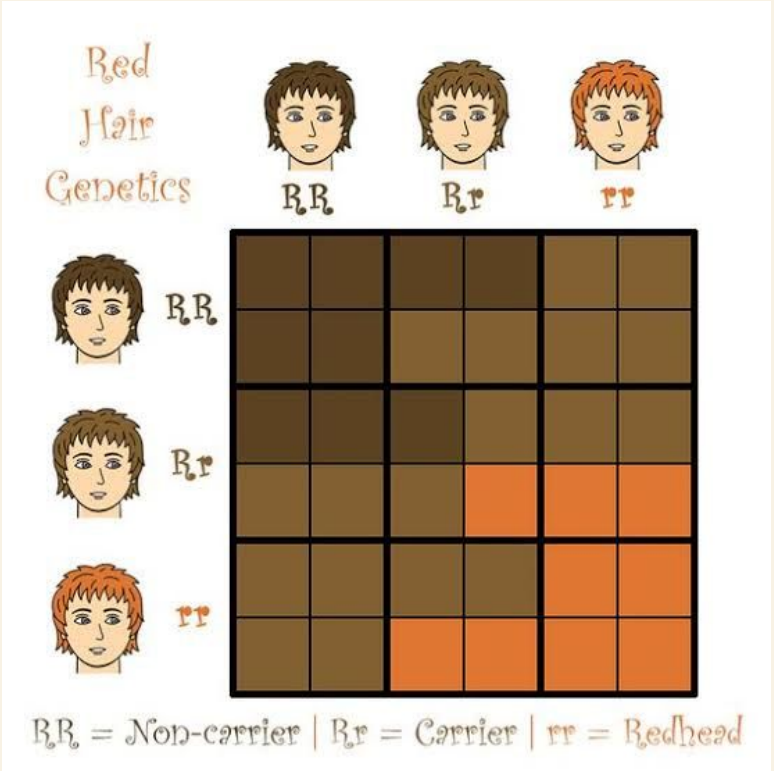
Organism	Total number of chromosomes
Human	46
Dog	78
Goat	60
Yellowfever mosquito	6
Rice	24
Snail	24
Artichoke	34
King crab	208
Coton	50
Mouse	40
Pinapple	50
Tasmanian devil	14
Chicken	78
Honey bee	32
Grey wolf	78



Genes

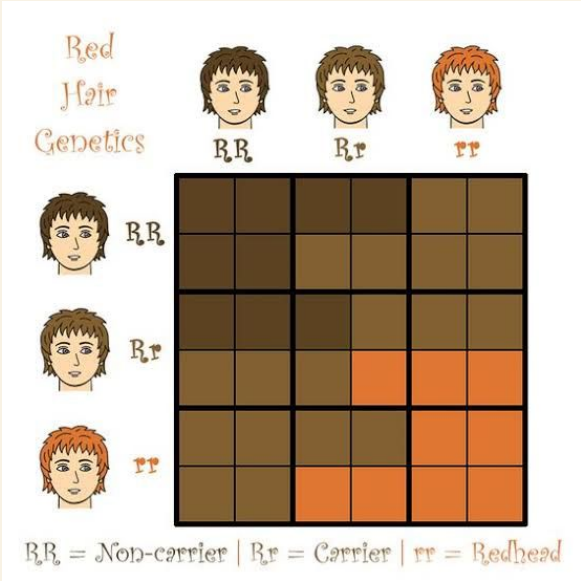
- **Genes** are formed from segments of DNA that contain genetic information that can range in size from 27,000 base pairs to 2,000,000 base pairs.

- Every human has the same set of genes (approximately 20,000). The differences come from slight variations in these genes.



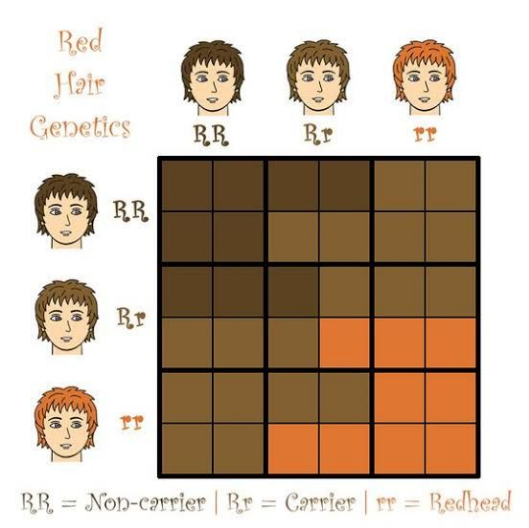
Genes

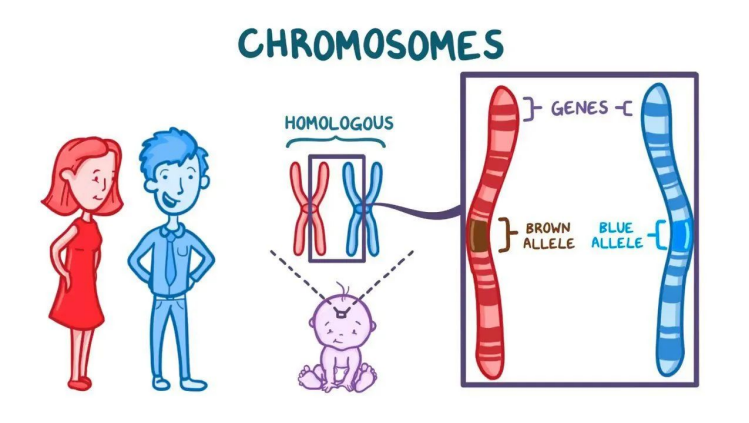
- Different forms of the same gene are called **alleles** (23 pairs of chromosomes).
- One allele for the same gene exists on each chromosome.
- These different alleles account for differences in specific traits.



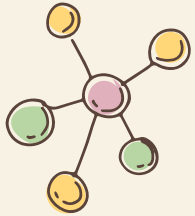
Genes Continued

Example: A person with red hair doesn't have the "red hair gene" while a person with brown hair has the "brown hair gene". Instead, these different versions of these genes called **alleles** dictate whether someone will be redhead or brunette.





Review



1. What is DNA?
2. Describe the basic structure of DNA. Draw it!
3. What are the nitrogenous or chemical bases and how do they pair up?
4. How does 2 meters of DNA fit into the small nucleus of a cell?
5. What is the difference between a gene and an allele?
6. What is the significance of the order of base pairs in DNA?

Challenge Question: If there is 30% of adenine present in a strand of DNA, what percent of cytosine is present?