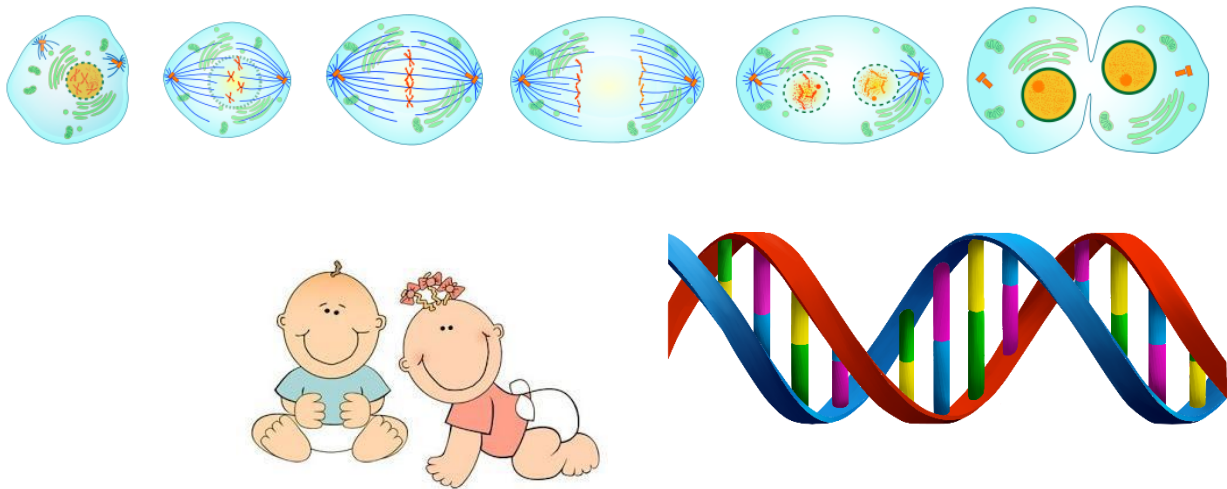


RE9.1

Examine the process of and influences on the transfer of genetic information and the impact of that understanding on society past and present.

Indicators for this outcome

- (a) Identify questions to investigate related to genetics.
- (c) Recognize that the nucleus of a cell contains genetic information and identify the relationship among chromosomes, genes, and DNA in transmitting genetic information.
- (d) Identify examples of dominant and recessive traits in humans and other living things.
- (e) Observe, collect, and analyze class and/or family data of human traits that may be inherited from parents (e.g., eye colour, chin shape, ear lobes, and tongue rolling).



DNA Structure

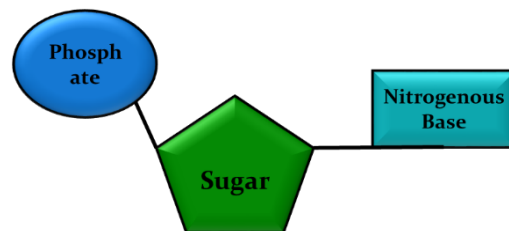
Why study DNA?

- It is the genetic material that is _____ (passed on) from parents to their offspring
- Half of your DNA is from your _____ and the other half is from you _____.

DNA:

- DNA consists of two molecules that are arranged into a ladder-like structure called a _____.
- A molecule of DNA is made up of millions of tiny subunits called _____.
- Each nucleotide consists of:

1. _____
2. _____
3. _____ base



Nucleotides

- The _____ and _____ form the backbone of the DNA molecule, whereas the _____ bases form the "rungs".
- There are _____ types of nitrogenous bases.



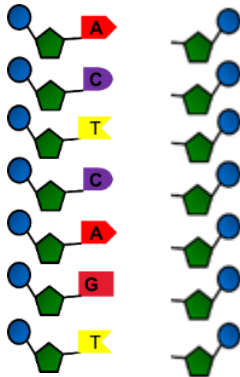
- Each base will only bond with _____ other specific base.

- Adenine (A) Thymine (T) - Form a base pair

- Cytosine (C) Guanine (G) - Form a base pair

DNA Structure

- Because of this _____ base pairing, the order of the bases in one strand determines the order of the bases in the other strand.



- To crack the genetic code found in DNA we need to look at the sequence of bases.
- The bases are arranged in triplets called _____.

A G G - C T C - A A G - T C C - T A G

T C C - G A G - T T C - A G G - A T C

- A gene is a section of DNA that codes for a _____.

- This unique sequence of bases will code for the production of a unique _____.
- Proteins make up just about all of you!
- It is these proteins and combination of proteins that give us a unique _____.

Organization:

Each unique gene has a unique sequence of bases or _____ which is universal.

All living organisms use the A T C G " _____ " to make " _____ " (genes).

DNA never leave the _____.

Each human cell contains about _____ of DNA.

In order to fit all of the DNA into the nucleus of the cell, the DNA needs to be tightly packed together or condensed into structures called _____.

Extract your own DNA from cheek cells

Individual strands of DNA are too small to be visible to the eye. One million threads of DNA fit onto the period at the end of a sentence using Times New Roman, font 12 in WORD. The reason

why we are able to see DNA in this activity is that there are so many of them, clumped together.

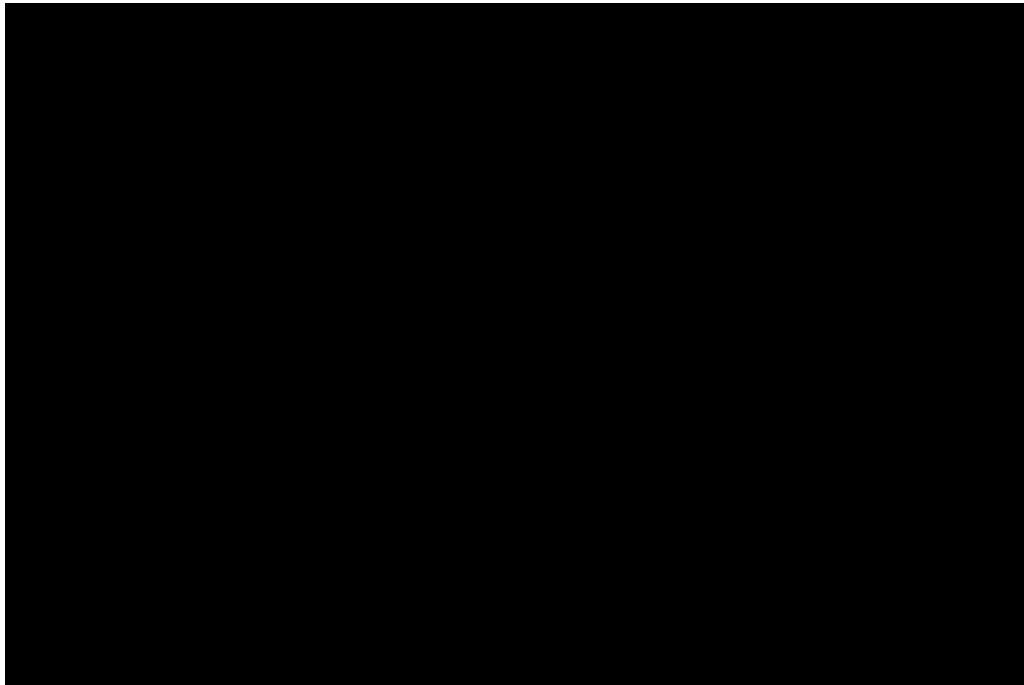
DNA extraction is a fairly simple procedure that requires only a few steps:

1. The detergent breaks open the cells by destroying the fatty membranes that enclose the cells as well as the nuclei membranes within the cells. DNA is released into the solution. Detergent and the salt also helps strip away proteins that are associated with the DNA molecules.

2. DNA is NOT soluble in alcohol, whereas other cell parts are. By adding alcohol, DNA precipitates out of the solution and collects at the interface of the alcohol and soap layer. The colder the alcohol, the less soluble the DNA will be in it.

Activity:

Using the following video as a guide, extract your DNA!



<https://www.youtube.com/watch?v=Ah44nJYHKCA>

Include observations about your DNA extraction. You may include photos or videos.

Questions:

1. Which of the following things would not contain DNA?
 - humans
 - plants
 - water
 - plastic
2. Where in the cell is DNA located?
3. What are the 2 components of DNA?
4. What are the four bases of DNA?
5. Draw a complete strand of DNA with appropriate base pairs for the following half strand:

CCGATTACTGGCCAT

Label a nucleotide, backbone, and base pair.

Genetics and Inheritance

Vocabulary Terms:

Characteristic - category of a trait

For example -

Traits - the qualities of an individual

For example -

Dominant trait - when the majority of organisms show this trait

For example -

Recessive trait - when the minority of organisms show this trait

For example -

Sperm, Egg, and Alleles

- All our chromosomes are in _____
- We have _____ pairs of chromosomes _____ set came from our mother's _____ and the other from our father's _____
- $23 + 23 = \text{_____}$ chromosomes
- Allele - one member of a pair of genes
- Because alleles are parts of chromosomes they also occur in pairs

For example - you get _____ allele for tongue rolling from your _____ and _____ from your _____ to make a pair

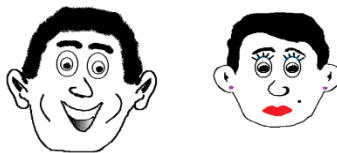
Bill Nye - Genes

1. The way you are is determined by who?
2. Where do the instructions for what you are come from?
3. How are genes stored?
4. What is your whole body made of?
5. The bundles of chemical inside your cells are made of...
6. What is deoxyribonucleic acid?
7. What are the four main chemicals which make up DNA
8. DNA is _____ times longer than it is wide.
9. Thousands of genes join together to form...
10. Where are chromosomes found?
11. Why are white blood cells darker than red blood cells when stained?
12. What are pattern pieces for making a lab coat, similar to in cells?
13. How do cells know what functions to perform?
14. All the instructions to make a human are stored in _____.
15. Humans have _____ pairs of chromosomes.
16. If each chromosome is a book, a chapter is a _____.

17. How many chromosomes does an egg have _____?
Sperm _____?
18. _____ cells are needed to make a whole new person.
19. _____ combinations of genes can be made by human cells.
20. What are the four chemicals which make up DNA?
21. A mule comes from...
22. Mules have _____ chromosomes
Donkey's have _____ chromosomes
Horses have _____ chromosomes
23. What are the two kinds of tongue rolling genes?
24. When are recessive traits visible in a humans?

Genotype

- Genotypes show _____ alleles for a trait
- There are three kinds of genotypes:
 - 1.
 - 2.
 - 3.
- If a dominant allele is present, an organism _____ have the trait (EE or Ee)
- The only way the recessive trait will appear is if there is only _____ alleles (ee)



What are the possible genotypes of the two people above if having earlobes is the dominant trait (E)?

The males possible genotypes are:

The females possible genotype is:

Phenotype

- A phenotype is the trait determined by reading the _____
- It is the _____ appearance of a trait
- It is how an organisms _____

What are the phenotypes of the ears of the people above?

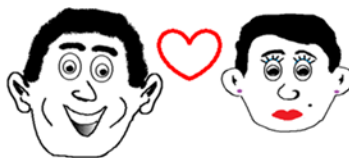
The man's phenotype is:

The woman's phenotype is:

Inheritance

- Inheritance occurs when _____ are passed down from _____ to a _____
- We can use the information we have learned to make predictions about what features kids will inherit from their parents

Remember, each parent can only contribute _____ of their _____ alleles to the child



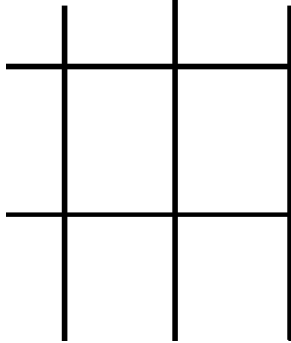
If the dad has a genotype of EE, what types of alleles can he contribute?

- Dad can contribute an _____ allele or an _____ allele

If the mom has a genotype of ee , what types of alleles can she contribute?

- Mom can contribute an _____ allele or an _____ allele

What are the possible genotypes for the resulting child?



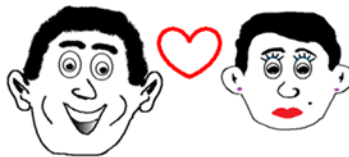
Option One:

Option Two:

Option Three:

Option Four:

What are the possible phenotypes for the resulting child?



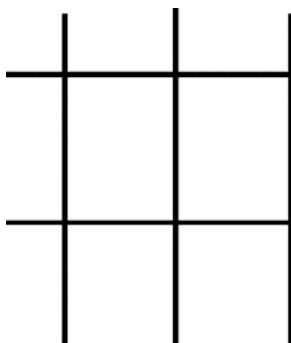
If the dad has a genotype of Ee , what types of alleles can he contribute?

- Dad can contribute an _____ allele or an _____ allele

If the mom has a genotype of ee , what types of alleles can she contribute?

- If Mom can contribute an _____ allele or an _____ allele

What are the possible genotypes for the resulting child?



Option One:

Option Two:

Option Three:

Stolen from Ms. S. Campbell

Option Four:

What are the possible phenotypes for the resulting child?

Genetics Practice Problems

- Describe the genotypes given (use your notes to help you). The first two have been done as examples:
 - DD homozygous, dominant
 - Dd heterozygous
 - dd _____
 - Ss _____
 - ww _____
 - HH _____
- What is the difference between **phenotype** and **genotype**?
- In humans, brown eye color (B) is dominant over blue eye color (b). What are the **phenotypes** of the following genotypes? In other words, what eye color will they have?
 - BB _____
 - Bb _____
 - bb _____

5 Steps to Solve a Genetics Problem

- Determine the genotypes of the parents and assign letters to the alleles
- Set up your punnet square
- Fill in the squares. This represents the possible combinations that could occur during fertilization
- Write out the possible genotypic ratio of the offspring
- Determine the phenotypic ratio of the offspring

4. A heterozygous, black-eyed male mouse is crossed with a red-eyed female mouse. Determine the offspring. Black eyes are dominant over red eyes.

5. In humans, free earlobes (F) are dominant over attached earlobes (f). If one parent is homozygous dominant for free earlobes, while the other has attached earlobes, can they produce any children with attached earlobes?

6. In humans, Acondroplasia or "Dwarfism" (D) is dominant over normal (d). A homozygous dominant (DD) person dies before the age of one. A heterozygous (Dd) person is dwarfed. A homozygous recessive person is normal. IF a heterozygous dwarf man marries a heterozygous dwarf woman, can they have a normal child? What is the percentage of having a normal child?