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April 1, 2019 11:50 AM

Name: _____

Date: _____

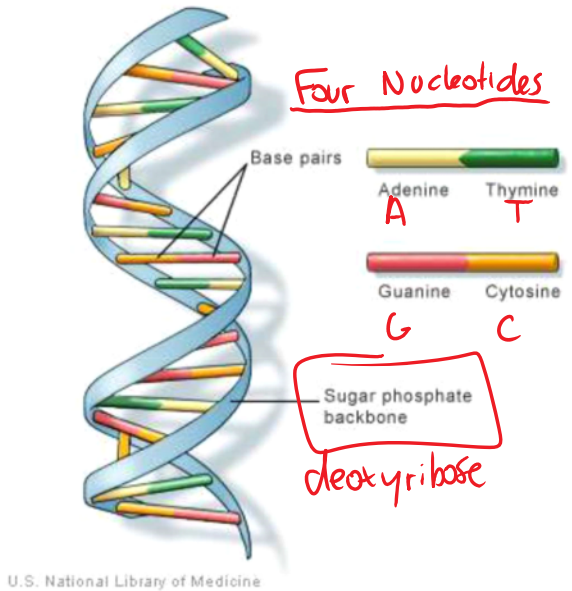
Block: _____

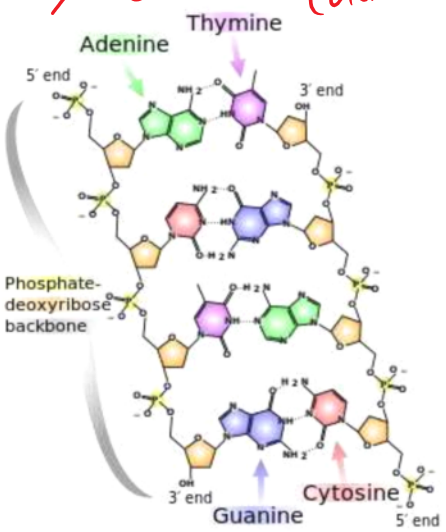
Genetics:
Lesson 1 – DNA

Deoxyribonucleic Acid: = DNA is a molecule that carries genetic information

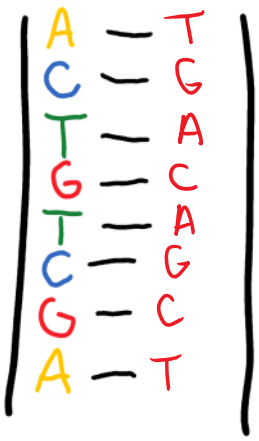
DNA is in the shape of a Double Helix, or a twisted ladder.

chemical model (don't know)





DNA Bases: aka Nucleotides; Nitrogen based molecules where genetic information is stored; They bond together to make genes in a DNA strand.



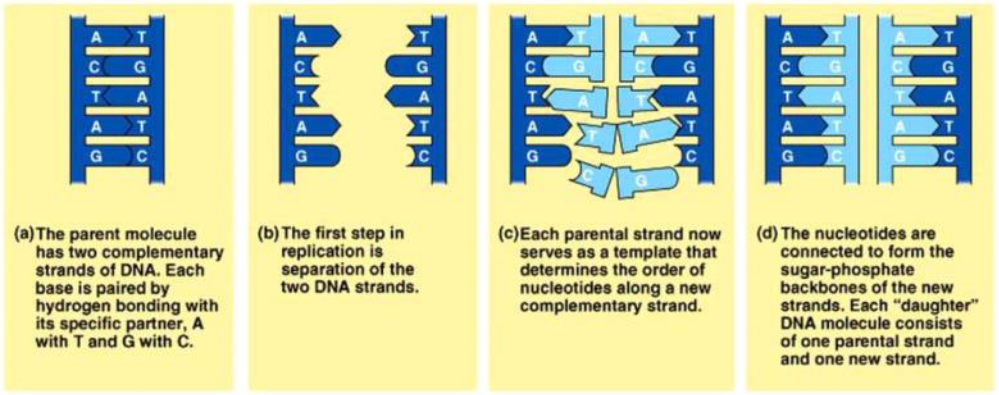
How does this work?

A always pairs with T

C always pairs with G

To duplicate

DNA Replication: This is when DNA splits in half and produces 2 exact copies of itself



(a) The parent molecule has two complementary strands of DNA. Each base is paired by hydrogen bonding with its specific partner, A with T and G with C.

(b) The first step in replication is separation of the two DNA strands.

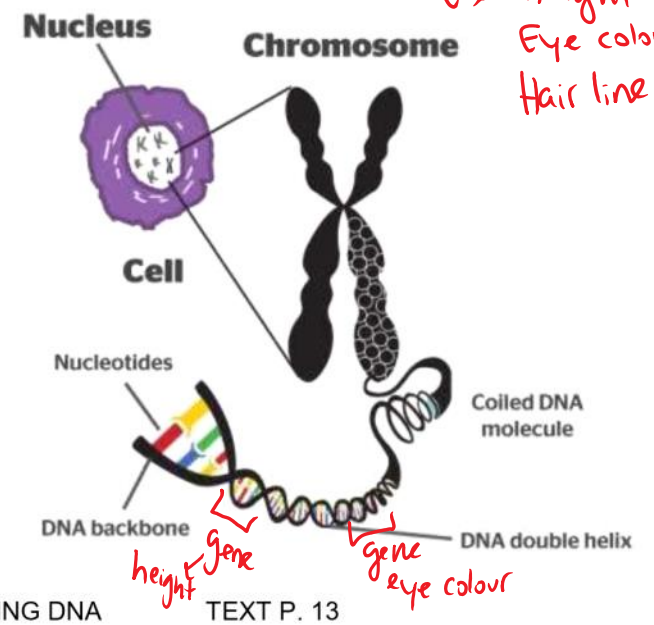
(c) Each parental strand now serves as a template that determines the order of nucleotides along a new complementary strand.

(d) The nucleotides are connected to form the sugar-phosphate backbones of the new strands. Each "daughter" DNA molecule consists of one parental strand and one new strand.

Chromosome: found in the nucleus. DNA that is packed into "chromosomes".

Gene: A piece or section of a strand of DNA that contains info related to a specific trait.

Ex Height
Eye colour
Hair line



LAB: MODELLING DNA TEXT P. 13

Name: _____

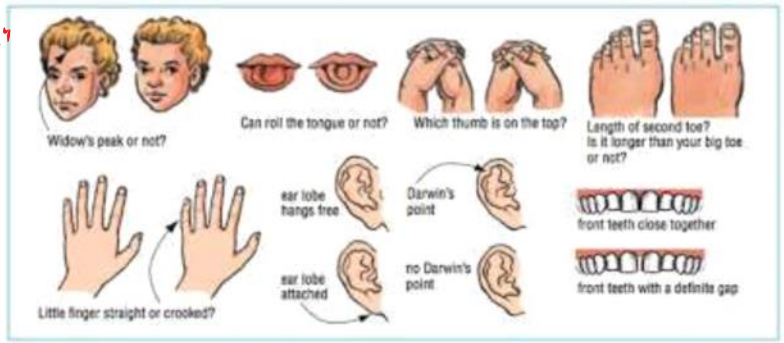
Date: _____

Block: _____

Genetics:
Lesson 2 – Genes

Gene: A stretch of DNA that determines a certain trait (eg height). Genes spell out instructions for making proteins. Proteins are the building blocks EVERYTHING. Everyone has 2 copies of each gene for every characteristic: ① from Mom (eggs) ② from dad (Sperm)

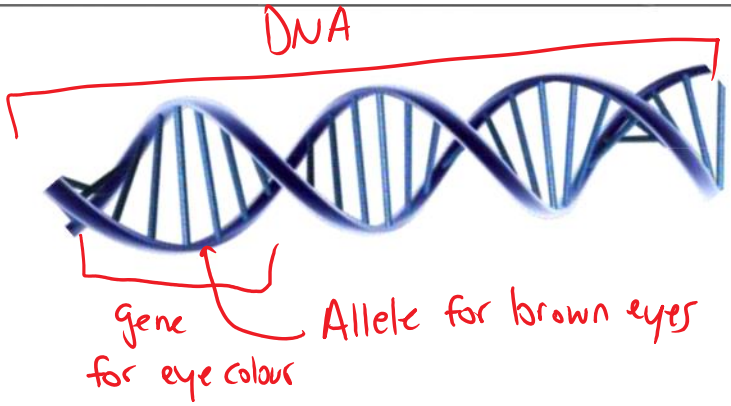
Allele: is one "variant" of a gene
Eg Allele for "short"
Allele for Tall



Genotype: A term to describe the genetic make up of an organism. Made up of two letters that represents alleles: eg Bb → curly hair (code to describe trait)

Trait: Characteristic: eye colour, height..

Phenotype: observable trait: blue eyes, Tall/short

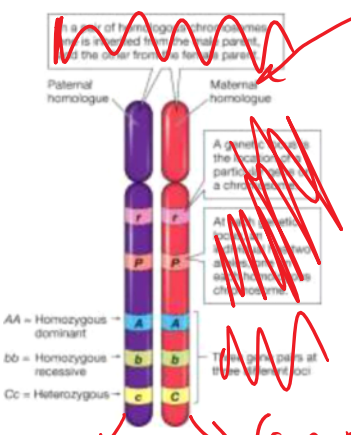


Chromosomes

Chromosomes are paired. Human body (somatic) cells have 46 chromosomes (called the Diploid number). They are organized into 23 pairs. For each of the pairs, one chromosomes is from the biological mother and one from the biological father. One of the pairs is the sex chromosomes. These are special and are referred to X and Y. The sex chromosomes are always considered a pair, despite the fact that they are not similar is size or structure. The remaining 22 pairs of chromosomes are called autosomes. Chromosomes are paired based on sharing similar characteristics, namely shape and structure.

Homologous Chromosomes p. 15

Homologous chromosomes are pairs of chromosomes that are similar in feature such as length and shape Within the chromosomes is the DNA with specific genes that code for certain traits the body. Homologous chromosomes carrier for certain traits such as hair type, at some location on chromosomes. They can however, carry different forms of the same gene – these are called alleles. These different forms account for difference in specific traits such as straight hair versus curly hair.



pair of homologous chromosomes

from momma

from daddy

Examining a Karyotype

A karyotype is a photograph of the pairs of homologous chromosomes in a cell. A cell sample is collected, stained to allow us to see banding patterns that can be seen under a microscope, then the chromosomes are arranged from largest, to smallest. The sex chromosomes are always at the end regardless of size. The

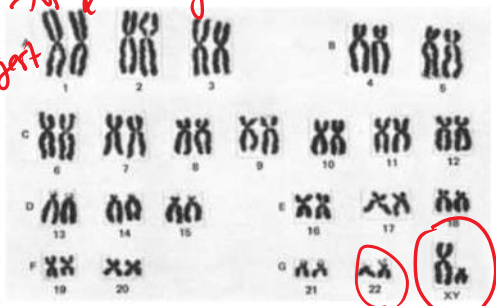
autosomes are labelled in pairs 1-22. If there are two xx chromosomes = female, if there is an xy pairing, then the karyotype is a male.

Example of a Karyotype.

This is a "normal" genetic male. Chromosomes are already doubled.

mommy → daddy

largest



smallest

→ Sex chromosomes

This is a normal genetic female. Chromosomes are not doubled yet. (Just a different phase of cell division)

Sometimes during cell division either in the sperm and eggs cells (gametes) Chromosomal abnormalities can occur. These leads to changes in the structure of the chromosomes which can cause Genetic Disorders and Diseases. These changes are called mutation. We can identify genetic disorders by examining a karyotype and comparing it to a genetically normal one.

Activity: Chromosome Study ** need scissors, glue, blank paper, and a Karyotype sheet

Lesson 4: **Heredity and Gregor Mendel** Date _____

Genetics is a field of biology that studies HEREDITY, which is the passing of traits from parent to offspring.

People have been doing genetics experiments for thousands of years that involved growing and raising food crops such as wheat and corn, cows, pigs and companion animals like horses and dogs.

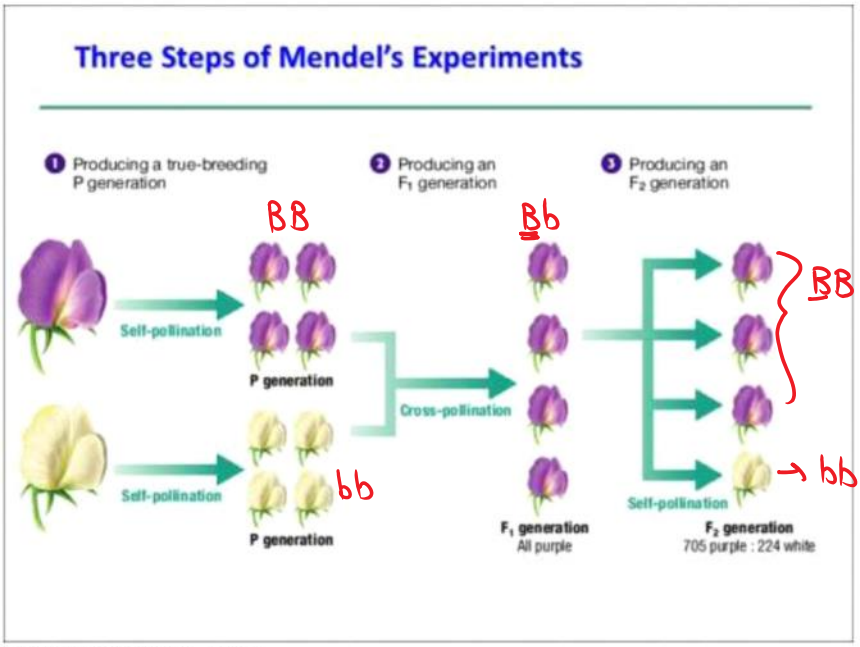
In the 1860's, Gregor Mendel, an Austrian monk, made the first discoveries about how traits are passed down from one generation to another

He used pea plants in his experiments and cross-pollinated them – this means he took a male gamete (sperm) from one flower and combined it with a female gamete (egg) of a different flower from a different plant. This allowed Mendel to control which plants, with certain traits, were producing offspring.

Mendel's Experiments p. 26

- started with pea plants with Purple flowers and ones with White.
- when purple flowered plants self-fertilized, they only produced purple flowers and when white flowered plants self-fertilized, they only produced white flowers (these types of plants are called True breeding plants
- Mendel decided to breed **purple flower** plant with **white flower** plant
- All the offspring from this cross are called first generation OR F1 and they were **ALL PURPLE FLOWERS.** Mendel wondered ***what happened to the white flower trait???***
- He then allowed these F_1 plants to self-pollinate....Result he called Second generation OR the F2. He observed that the white-flower trait reappeared in some of the flowers and the rest were purple

- After hundreds of experiments, he saw a pattern in the F_2 of a ratio of approximately 3:1 3 purple : 1 white.



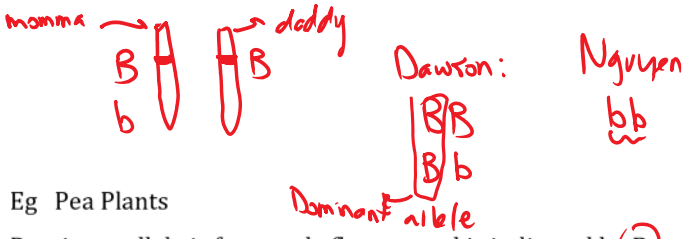
Mendel's Conclusions

1. Each plant had 2 factors (Alleles) that act as a set of instructions for each trait.
2. Each parent donates one of these alleles.
3. One allele or trait may DOMINATE over the other.

Dominant and Recessive Alleles text p. 28

Certain alleles for a given trait may be DOMINANT ~~or~~ over another allele for the same trait. This means that if an individual has two or even just one dominant allele, then they will have the dominant trait.

The trait that is associated with the RECESSIVE allele will only be observed if the individual carries 2 recessive alleles.



Eg Pea Plants

Dominant allele is for purple flowers and is indicated by B
Recessive allele is for white flowers and is indicated by b
The pairs of alleles (GENOTYPE) for purple flowered plants can be BB or Bb
The pair of alleles (GENOTYPE) for white flowered plants can ONLY be bb

GENOTYPE	BB	Bb	bb
PHENOTYPE (observed trait)	Purple	Purple	white

Homozygous Genotypes: If the alleles are identical eg BB, bb, TT, cc
a) homozygous Dominant: BB,TT
b) homozygous Recessive: bb,cc
Heterozygous Genotypes: Two different alleles for a trait eg Bb, Tt, Cc
*** heterozygous genotype produces the dominant trait

TEXTBOOKS
ACTIVITY: Dominant vs Recessive Trait? p. 30

Ear lobs		
~~PTC tasting~~ Ability		
# people for whom ~~PTC was bitter~~ dangling	15	
# people for whom ~~PTC was not bitter~~ Attached	9	
Total number of people surveyed	24	
Percent of people for ~~whom it was bitter~~ dangling	15/24	DOMINANT???
Percent of people for ~~whom it wasn't~~ Attached	9/24	RECESSIVE???
FRECKLES IN OUR CLASS		
# people with freckles	19	
# people without	4	
Total number of surveyed	23	
Percent of people with freckles	19/23	DOMINANT???
Percent of people without freckles	4/23	RECESSIVE???

~~V... THE ... ALLELES AND GENES~~

Lesson 5 **Introduction to Punnett Squares** Date _____

What is PROBABILITY: The chance that a given event will occur

If you flip a coin ten times, what is the probability that it will land on tails each time? 50%

How is this similar to alleles on homologous chromosomes? 50/50 Chance of getting an allele from Mama vs Papa

A genetic cross is any type of deliberate breeding between a genetic male and a genetic female to produce offspring that carry the genes of each parent. When the parents DIFFER in one particular trait that is being studied, the cross is called a monohybrid cross. A hybrid is an offspring of parents that have different traits.

Example TT x tt (Dad, mom) Parents

T t Gametes (sperm + egg)

Tt offspring

PUNNETT SQUARE: a diagram used to show the probability of inheritance of traits in Monohybrid crosses.

- They are used to identify possible Genotypes of the offspring, given the genotypes of the parents
- We use percentages to illustrate the possibility of each genotype, and therefore phenotype that could result from the cross

Example 1: In horses, the allele for black hair (B) is dominant to the allele for red hair (b). If a heterozygous Black haired female horse is crossed with a red haired male horse, what are the possible genotypes and phenotypes?

a) What is genotype of the female? Bb Genotype of the male? bb

b) Parental cross: Bb x bb

Results of cross:

Female Allele

male allele

	b	b
B	Bb	Bb
b	bb	bb

what we see

Genotype:	Phenotype:
Bb	Black hair
bb	red hair

2/4 boxes are Bb, 50% of black hair

2/4 boxes are bb, 50% of red hair

Example 2: A male with the recessive trait of straight hair (h) is crossed with a female that has the homozygous dominant (H) genotype for Widow's peak.

a) What is the genotype for the Male? hh The female? H H
b) Draw a Punnett square that shows the possibilities for their children.

male allele

female allele	h	h
H	Hh	Hh
H	Hh	Hh

RESULTS:

Genotype: all Hh

Phenotype: 100% widow's peak

Pp P

Example 3 Two heterozygous pink flowered plants are crossed. If Pink is Dominant and white is recessive, what are the possibilities for flower colour, of their offspring)?

P	P	p
P	PP	Pp
p	Pp	pp

RESULTS: 1/4 2/4 1/4

Genotypes: PP, Pp, pp

Phenotypes: 75% Pink

25% white

Activity:

1. YOUR GENES – COMPLETE THE WORKSHEET AS INDICATED
2. CELEBRITY MATCH MAKING
3. BIKINI BOTTOM GENETICS – the love life of Sponge Bob, Patrick, Squidward and Mr Krabbs