

Why are you the way you are?

GENETICS

GENETICS

Word

Definition

Genetics:

the study of heredity

Heredity/
Inheritance

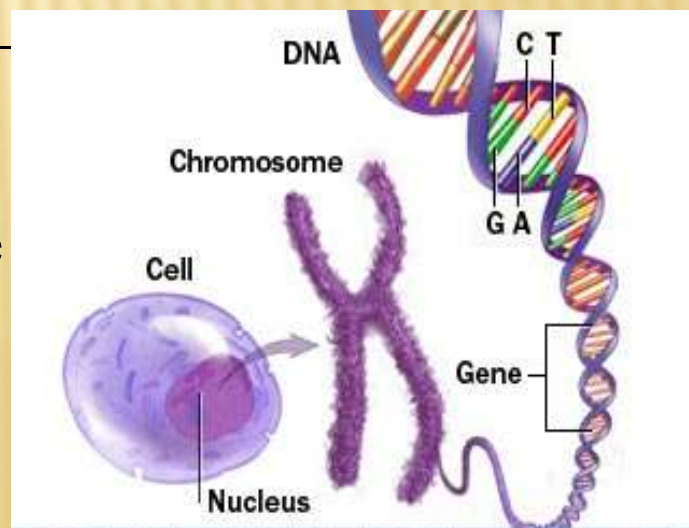
the process by which traits are passed from one generation to the next.

Probability

possibility that an event may or may not take place

DNA
(deoxyribonucleic acid):

large molecule of genetic information that is passed from one generation to the Next.



DNA EXTRACTION LAB

- ✗ Display lab safety contract
- ✗ Once verified, clear off table
- ✗ Read through lab procedure
- ✗ Complete lab
- ✗ Pour liquid down drain, but not the fruit!
- ✗ Dump the content of the beaker in the trash near my desk
- ✗ Rinse the beaker and set it to dry

MORE GENETICS

Word

Definition

Chromosome:

rod-shaped structure of coiled DNA that contains the directions (genes) for cell activities and traits

Gene

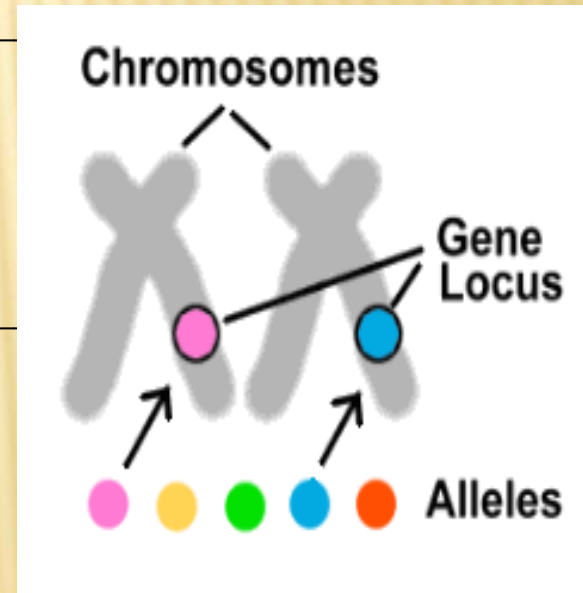
basic unit of heredity, the “instructions” for a trait (locus=location)

Allele

A form of a gene, so if the gene is eye color, the allele is which color-brown allele, Blue allele, green allele...

Karotype

Photograph of chromosomes laid out in order from largest to smallest, followed by sex chromosomes





Case: GL79961G Slide: A'1 Cell: 11C

Patient name: JACOBS, LISA(FETUS OF)

Result:

Technologist: MV

Date: 1/12/07



- ✘ Dominant and Recessive Traits Activity

 - + Collect class data

- ✘ Transparent Traits Activity (white boards)

- ✘ Bill Nye with quiz!!

SOME MORE GENETICS

Word

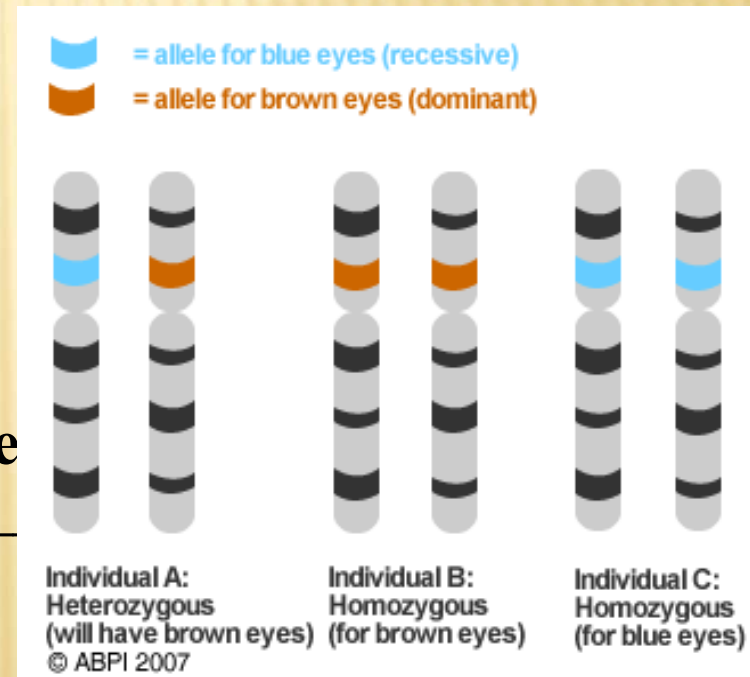
Definition

DOMINANT

stronger trait, represented with a capital letter-for example T
Brown eyes are DOMINANT over blue

recessive

a weaker trait, represented with a lower case letter-for example t
Both must be recessive to show!!



DISCOVERY OF GENETICS TIMELINE

- ✗ Foldable like cell timeline
- ✗ Must include 7 events
- ✗ Each event must include the date (just year ok)
- ✗ Each event must also include the person or persons involved with the event.
- ✗ Each event must be described with details.
- ✗ **ALL of this information can be found in Chapter 23 Sections 1-4 of the Life Science book.**

DISCOVERY OF GENETICS TIMELINE

- ✘ 1860's Gregor Mendel-"Father of Genetics" Determines idea of traits being passed from one generation to the next.
- ✘ 1886 Hugo De Vries- Determined mutations
- ✘ 1900 Karl Correns- Discovered incomplete dominance
- ✘ 1900's Reginald C. Punnett- Developed Punnett squares for determining probability of traits.
- ✘ 1900 Walter Sutton- Determined genes found on chromosomes.
- ✘ 1907 Thomas Hunt Morgan- Determined sex chromosome, determines sex of organism
- ✘ 1953 James Watson, Francis Crick, and Maurice Wilkens- Discovered the structure of DNA, won Nobel Prize 1962.

1966 Discovery: Genetic Code Cracked
Marshall Nirenberg and others figure out the genetic code that allows nucleic acids with their 4 letter alphabet to determine the order of 20 kinds of amino acids in proteins.

1973 Discovery: First animal gene cloned
Researchers fuse a segment of DNA containing a gene from the African clawed frog *Xenopus* with DNA from the bacterium *E. coli* and placed the resulting DNA back into an *E. coli* cell. There, the frog DNA was copied and the gene it contained directed the production of a specific frog protein.

1975 Discovery: DNA Sequencing Two groups, Frederick Sanger and colleagues, and Alan Maxam and Walter Gilbert, both develop rapid DNA sequencing methods. The Sanger method is most commonly employed in the lab today, with colored dyes used to identify each of the four nucleic acids that make up DNA.

1987 Discovery: First Human Genetic Map
The first comprehensive genetic map is based on variations in DNA sequence that can be observed by digesting DNA with restriction enzymes. Such a map can be used to help locate genes responsible for diseases.

1990 Discovery: Launch of the Human Genome Project The Department of Energy and the National Institutes of Health announce a plan for a 15-year project to sequence the human genome. This will eventually result in sequencing all 3.2 billion letters of the human genome.

1994 Discovery: FLAVR SAVR Tomato The Food And Drug Administration approves the sale of the first genetically modified food.

1996 Birth of Dolly the Sheep, first successful mammal clone
Started in test tube then placed in female and born on July 5th
<https://www.genome.gov/Pages/Education/GeneticTimeline.pdf>

2000 Discovery: Human Genome Working Draft Completed By the end of Spring 2000, HGP researchers sequence 90 percent of the human genome with 4-fold redundancy. This working draft sequence is estimated to be 99.9% accurate.

2003 Discovery: Completion of the Human Genome Sequencing The finished human genome sequence will be at least 99.99% accurate.

<http://science.howstuffworks.com/life/genetic/cloning3.htm>

<http://www.nature.com/scitable/topicpage/genetically-modified-organisms-gmos-transgenic-crops-and-732>

HISTORICAL FIGURES CURRENTLY USED

- ✘ <http://disneyjunior.disney.com/miles-from-tomorrowland>
- ✘ Name the 3 scientists mentioned in the cartoon clip.
- ✘ Watson, Crick, Marie Curie

PUNNETT SQUARES

- ✗ Punnett's squares vocab (Glue in toolkit)
 - + Parental and Filial
- ✗ Pea Worksheet (glue in toolkit)

PUNNETT'S SQUARES VOCAB

✗ P= Parental F=Filial

+ P₁=Parents (First Generation)

+ F₁=First Filial (Second Generation)

+ F₂=Second Filial (Third Generation)

✗ Example:

+ P: BB x bb with F₁ Possibilities:

+ F₁: Bb x Bb with F₂: Possibilities:

PUNNETT'S SQUARES VOCAB CON'T

✘ Example:

+P: BB x bb with F₁ Possibilities:

+F₁: Bb x Bb with F₂: Possibilities:

✘ Example:

+P: BB x bb with F₁ Possibilities:

+F₁: Bb x Bb with F₂: Possibilities:

EVEN MORE GENETICS

Word

Definition

Homozygous
(Purebred)

an organism with 2 of the SAME genes for a particular trait-for example TT or tt

Heterozygous
(Hybrid)

an organism with 2 DIFFERENT genes for a particular trait-for example Tt

Phenotype

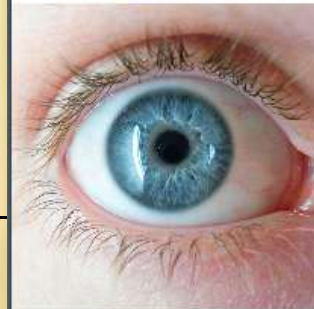
physical or visible trait of an organism-for example the **color** of eyes

Genotype

genetic make up of an organism-for example **Bb** or **BB** or **bb**

Phenotype= Blue Eyes

Phenotype=Brown Eyes

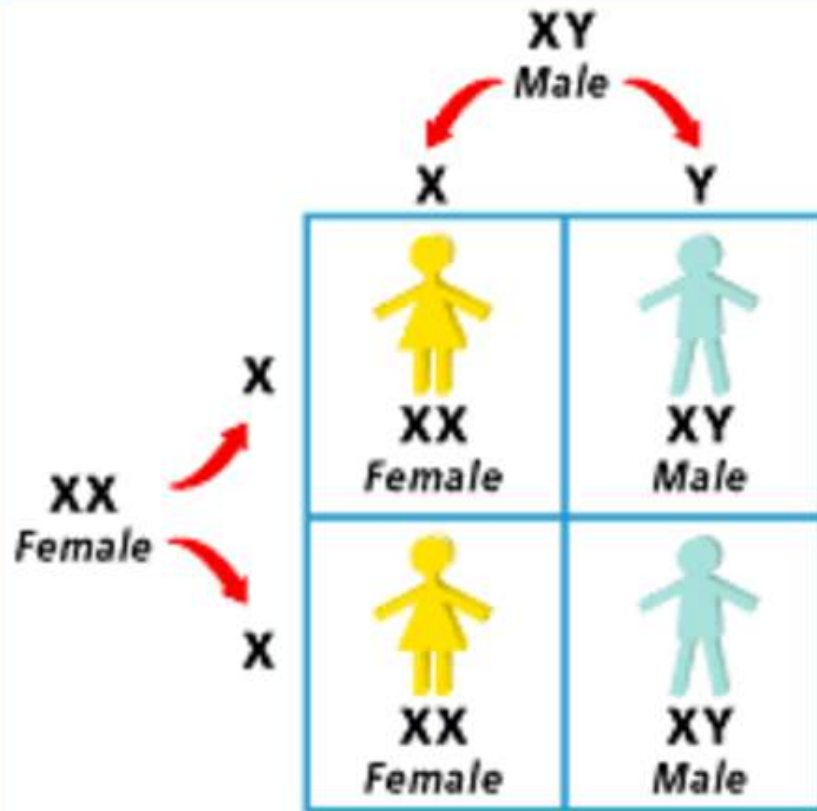


Genotype=**bb**
Recessive=**b**



Genotype = **Bb** or **BB**
Dominant = **B**

DETERMINING SEX (GENDER)



-Males have an XY

-Females have 2 XX

-Activity:

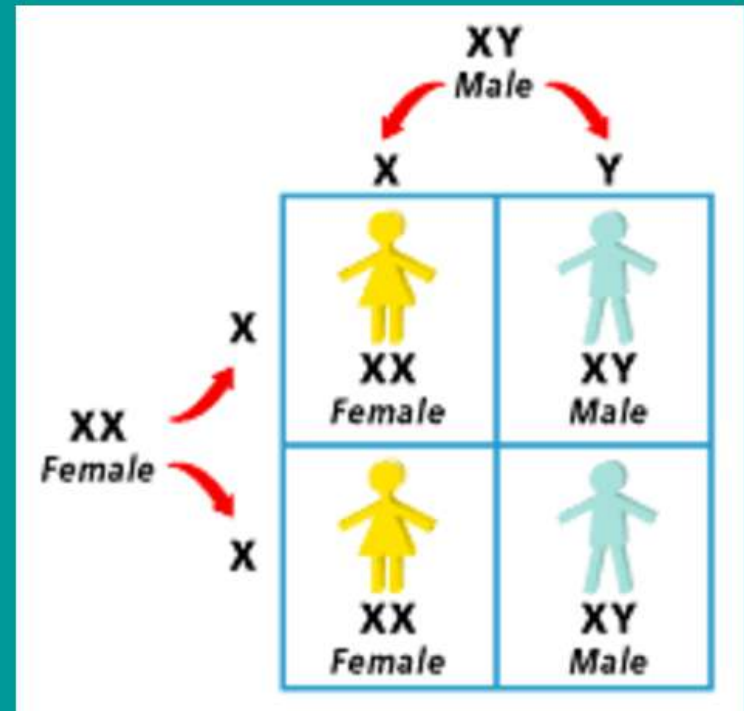
Is it a boy or a girl?

GENETICS OF BLOODS

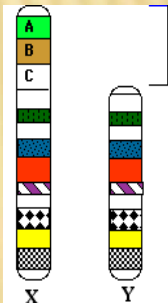
- ✘ You will be partnered up and given an activity sheet.
- ✘ Read and complete the directions **CAREFULLY** and **THOROUGHLY!!**

ODDITIES IN GENETICS

- ✘ Incomplete Dominance and Co-Dominance (Multiple Alleles section)
 - + Complete worksheet after writing definitions
- ✘ Sex-linked traits
- ✘ Mutations(glue in toolkit)



ADDITIONAL GENETICS

Word	Definition
<u>Incomplete Dominance:</u>	condition where neither trait is truly dominant nor recessive, so they blend-red and white make pink
<u>Co-dominant:</u>	condition when two genes are both dominant, so they both appear and share dominance-AB blood type
<u>Sex-linked Trait:</u>	traits that are passed on to the next generation on a sex chromosome (X or Y)  <p data-bbox="1545 806 1874 1135">Any trait, dominant or recessive, in this section of X chromosome then it will be expressed in a Male</p>
<u>Mutation</u>	change in a gene which then causes a change in a protein which causes a new trait to be inherited- can be good, bad, or neutral

UNDERSTANDING SEX-LINKED TRAITS

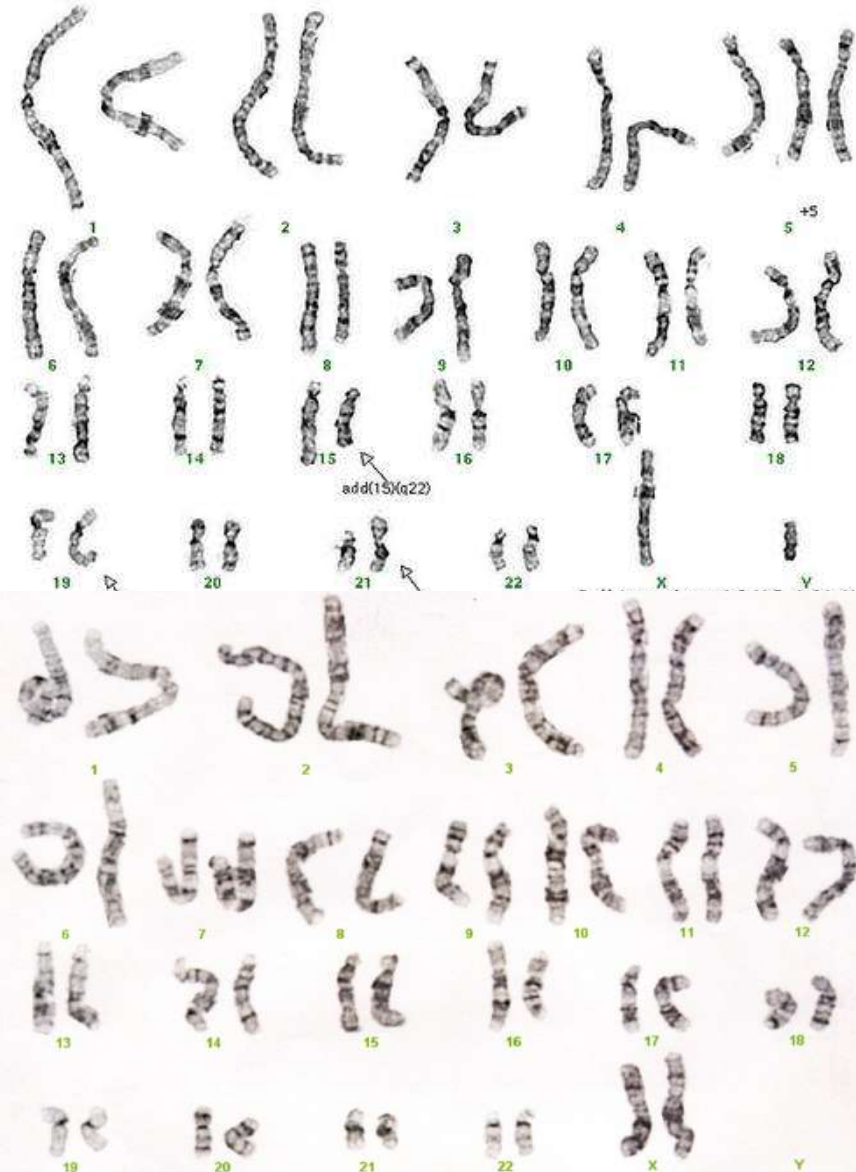
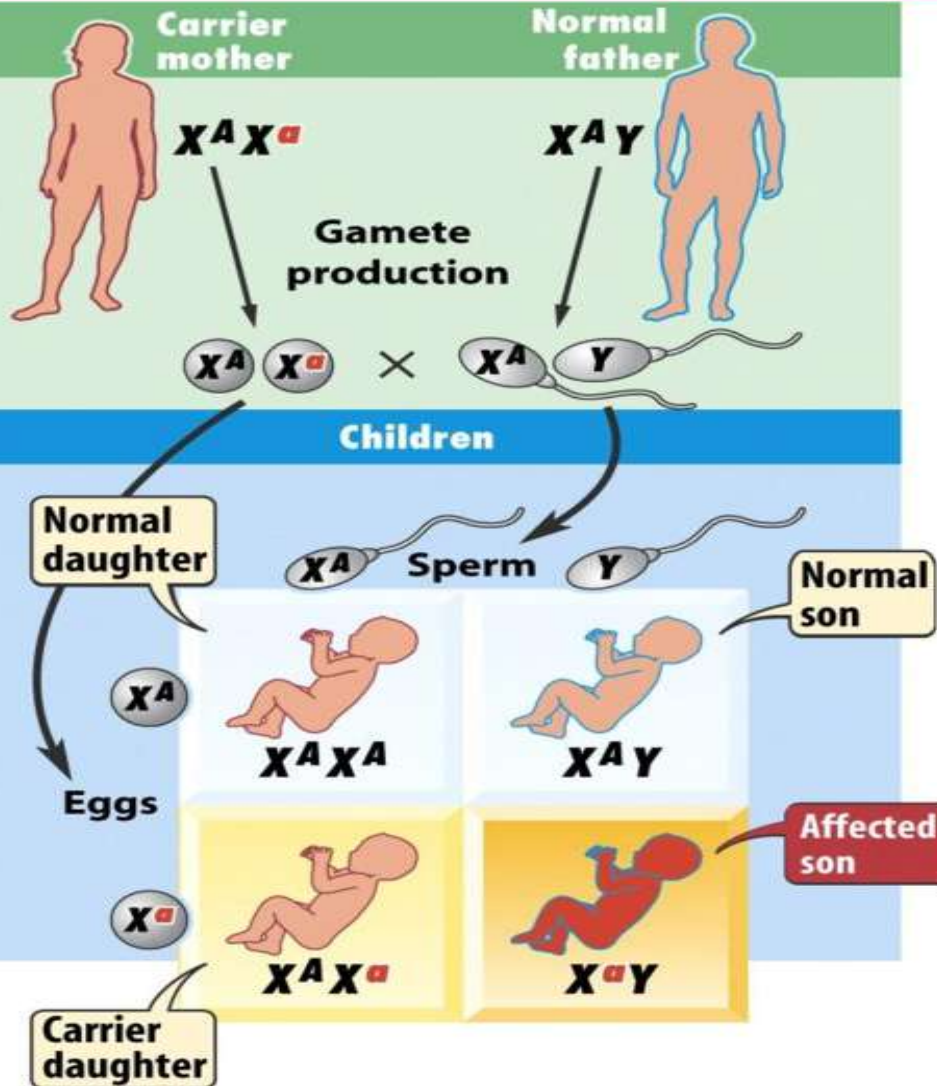
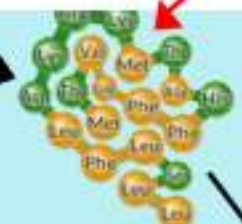


Figure 11-11 Discover Biology 3/e
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Genes are sections of **DNA code**, each found at a specific location along a **chromosome**.

```
ATGACAGTGGGATTTTTCACGCAACAATGAAAAGGAAGA  
ACCTTTTCTAAGCCTATTCCTCTGCTACAGTTTGCCTCAG  
AGCTGCCAGTTCTCACCTCA  
TAATCGAGGAGAAGACAGAA  
TGCAACCTTTCAAAGAGCAA  
CAAATGAACCTCCCAGATC  
TCCCACCCATCTCCATTGTA  
GATTTAACTAAAAGATCCCA  
GAAAGTCAGCAGAAAAGAGG  
CAGAGAATAAGAAATCTTCC  
AAGAAAAATGCTGAACTGAA  
GGCACCTCCAAAACCAAGGC  
CCACACCTGCTGCTGACTGC  
GTGCCAAACTTCAAACCTG  
CAAACCACACTTGAATCCAT  
GTTGTAACACTGTGCGTTG  
TGCAAATGCCGAATTTTCA  
GACTATCTGCCAATGTCTAC  
TGTTAAACCCAAAGTGTAA
```

Through a series of steps that occur within the cell, a gene's code is translated into a molecule called a **protein**.



Each protein has a specific job in a cell.

Send Next 60 Letters



Because of its job, this protein, alone or in combination with other proteins, results in an organism having a **specific trait or characteristic**.

Metallic
The drake "Asip" gene codes for a signaling protein that controls the production of the color pigment melanin. Drake scales have an upper and a lower layer. When melanin is present in both scale layers, drake colors appear dull, not shiny. When melanin is present only in the lower scale layer, drakes appear as a shiny, metallic color. Metallic colored scales occur in drakes that have inherited a mutation in the Asip gene.

- Transcribe all
- Transcribe step by step
- Translate all
- Translate step by step
- Unfold protein
- Refold protein
- Reset

Human Inheritance and Genetic Disorders



Polydactyly



Hypertrichosis



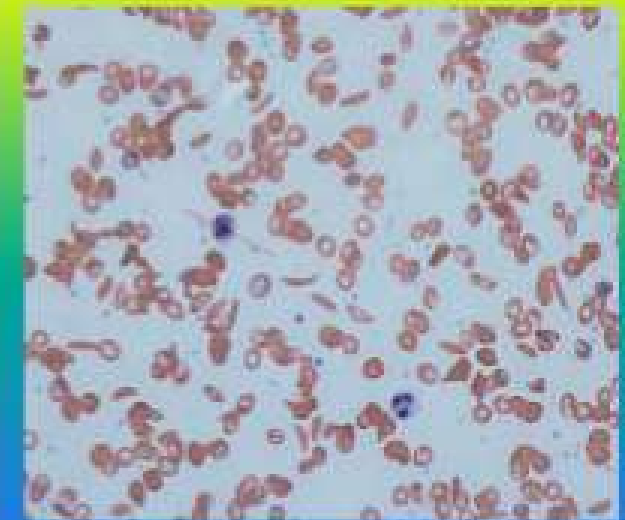
Progeria



Hemophilia



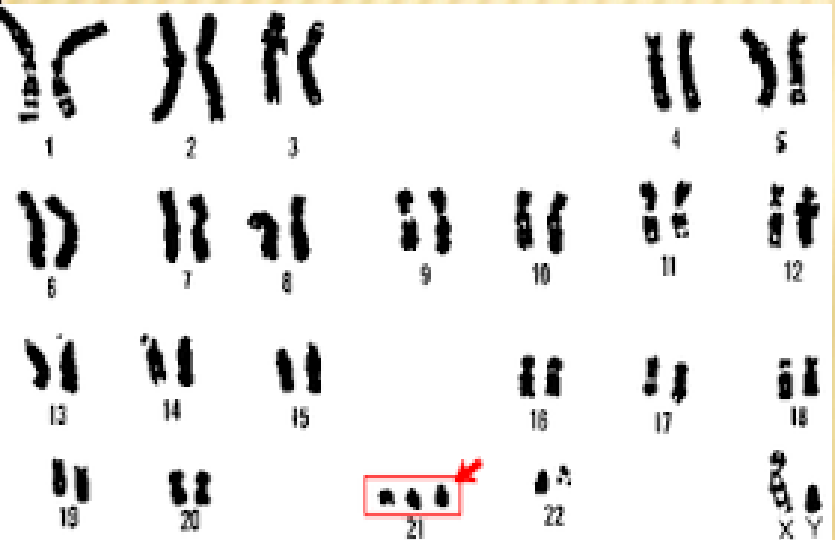
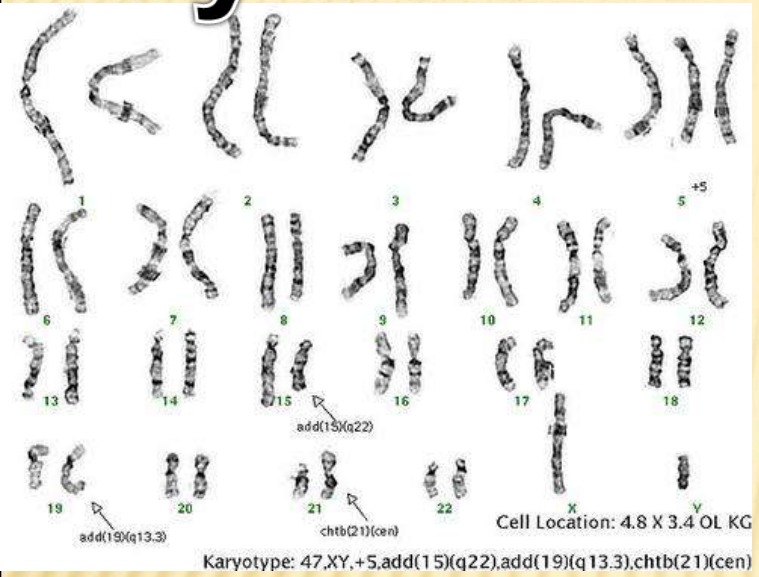
Down Syndrome



Sickle Cell Anaemia

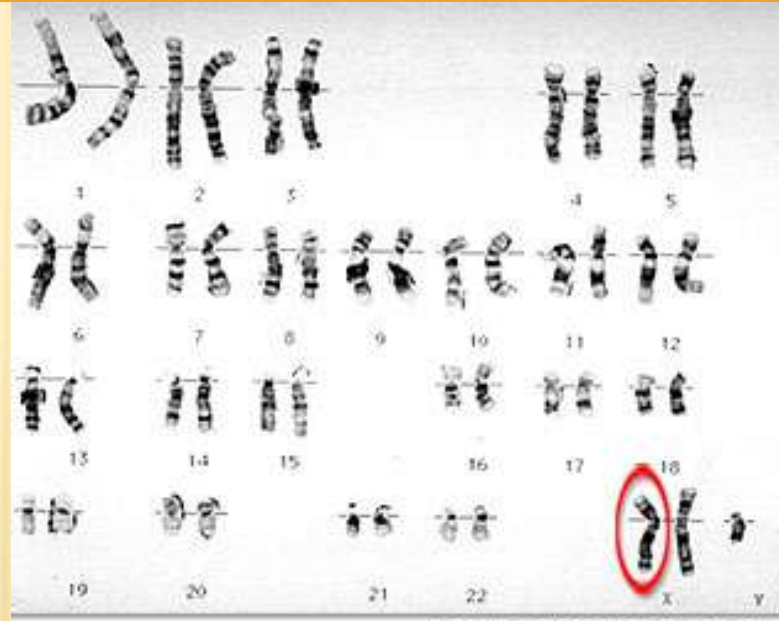
MORE ODDITIES

Tay Sachs



DOWN

Klinefelter

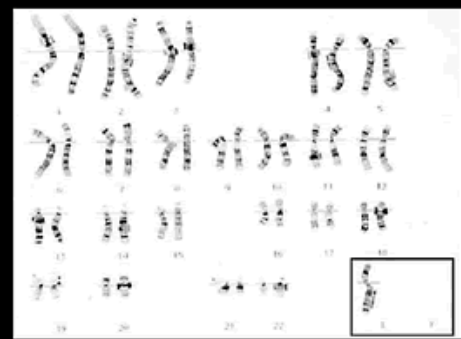


medgen.genetics.utah.edu

Turner Syndrome Sex Chromosomal Patterns

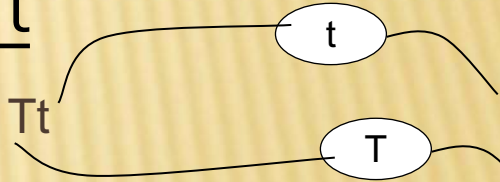
- ◆ Complete absence of X (45, X)
- ◆ Structural abnormalities
 - Partial X deletion
- ◆ Mosaicism (mixture of 2 cell lines)

Turner Syndrome Karyotype (45, X)¹



1. NIH. Electronic Citation; 2002.

LAWS OF GENETICS (2FLIPPER)

Word	Definition
<u>Law of Segregation:</u>	<p>law that states that gene pairs separate during sex cell formation- <u>Tt</u></p>  <p>The diagram shows a heterozygous pair of alleles, 'Tt', on the left. Two curved lines branch out from 'Tt' to the right, leading to two separate ovals. The top oval contains the lowercase letter 't', and the bottom oval contains the uppercase letter 'T', illustrating the segregation of alleles during meiosis.</p>
<u>Law of Independent Assortment:</u>	<p>law that states that each gene pair is inherited separately from other gene pairs- for example the gene represented by T would NEVER be paired with b.</p> <p><i>Blonde hair and blue eyes are NOT linked</i></p>

FINISHING UP GENETICS!

- ✘ Nature or Nurture? Determine if traits are from Nature (your genes) or Nurture (your environment), and why.
- ✘ Punnett Square Challenge:
 - + What are the 4 main blood types?
 - + Quick Switch Worksheet.
- ✘ Genetics Post Assessment on Tuesday!!!!