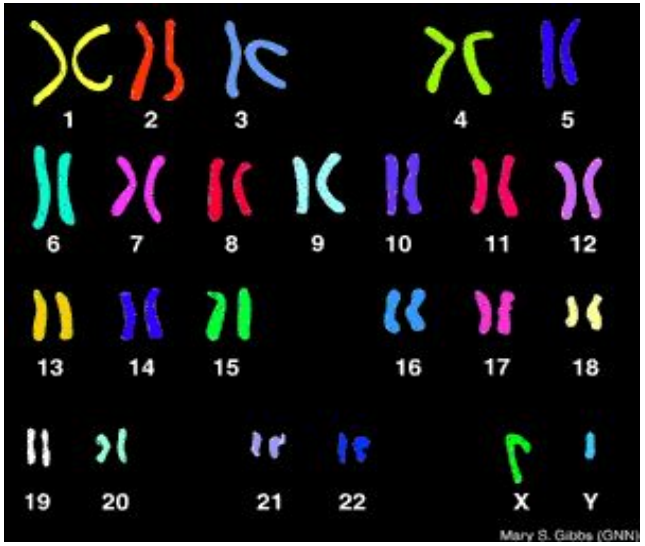
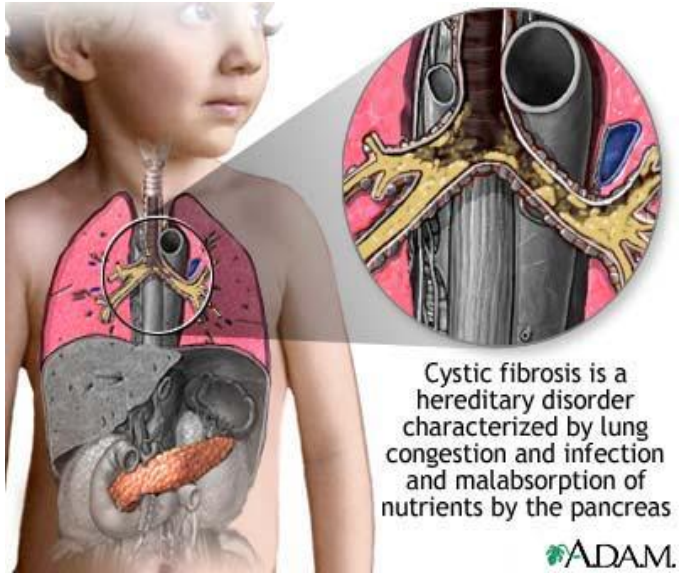
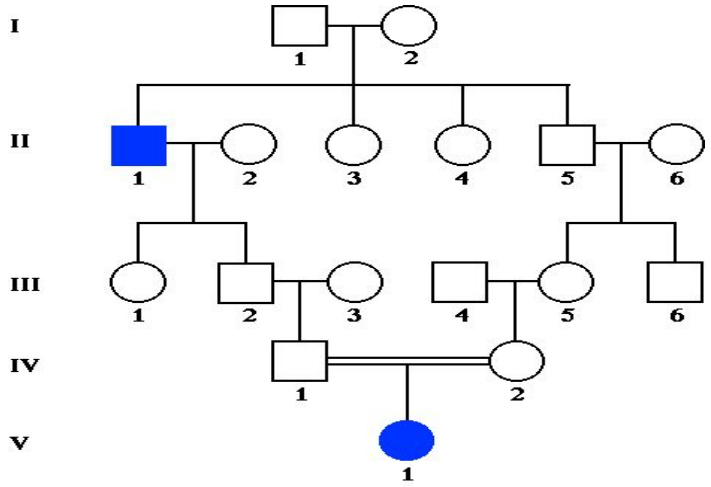
Human Heredity Notes

Chapter 14

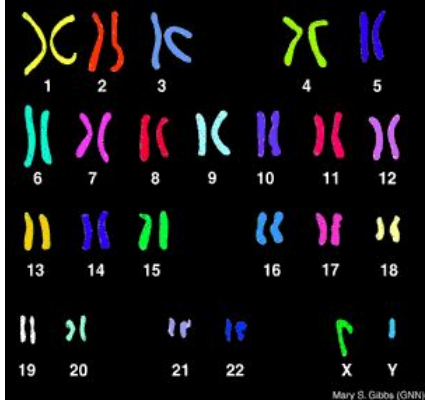
Page 391



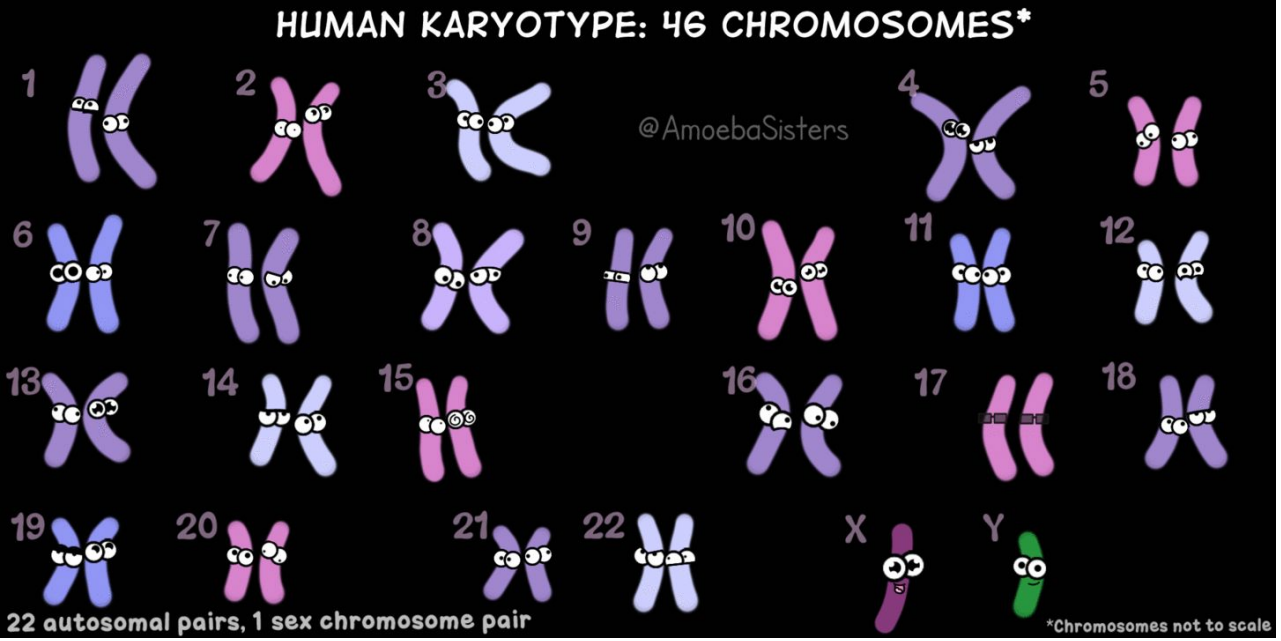




Genome



- The full set of genetic information that an organism carries in its DNA
- Scientists look at chromosomes to study the genome
- Chromosomes are best seen in metaphase (mitosis) since they are in the middle of the cell
- The chromosomes are cut and placed into a picture called a karyotype



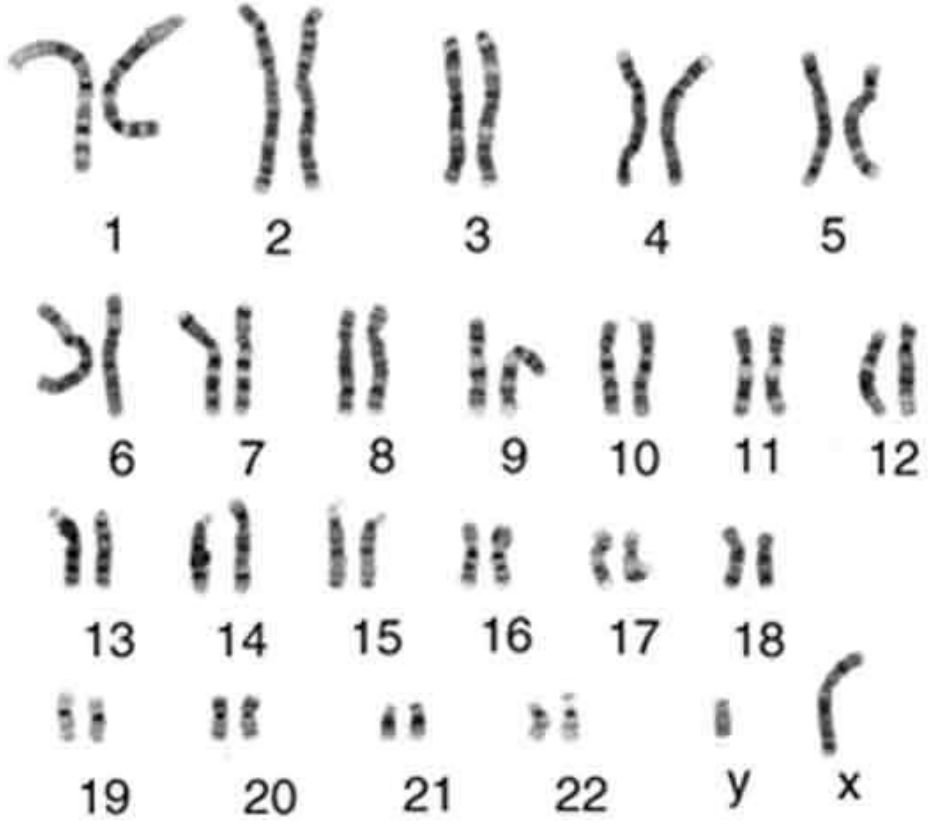
Karyotype

- A diagram that shows the complete diploid set of chromosomes grouped in pairs
- Arranged in <u>decreasing</u> size
- Humans have <u>46</u> total or <u>23</u> pairs
- <u>Chromosomes</u> are aligned in <u>pairs</u>
- The last set or the <u>23rd pair</u> are called the <u>sex chromosomes</u>

Karyotype

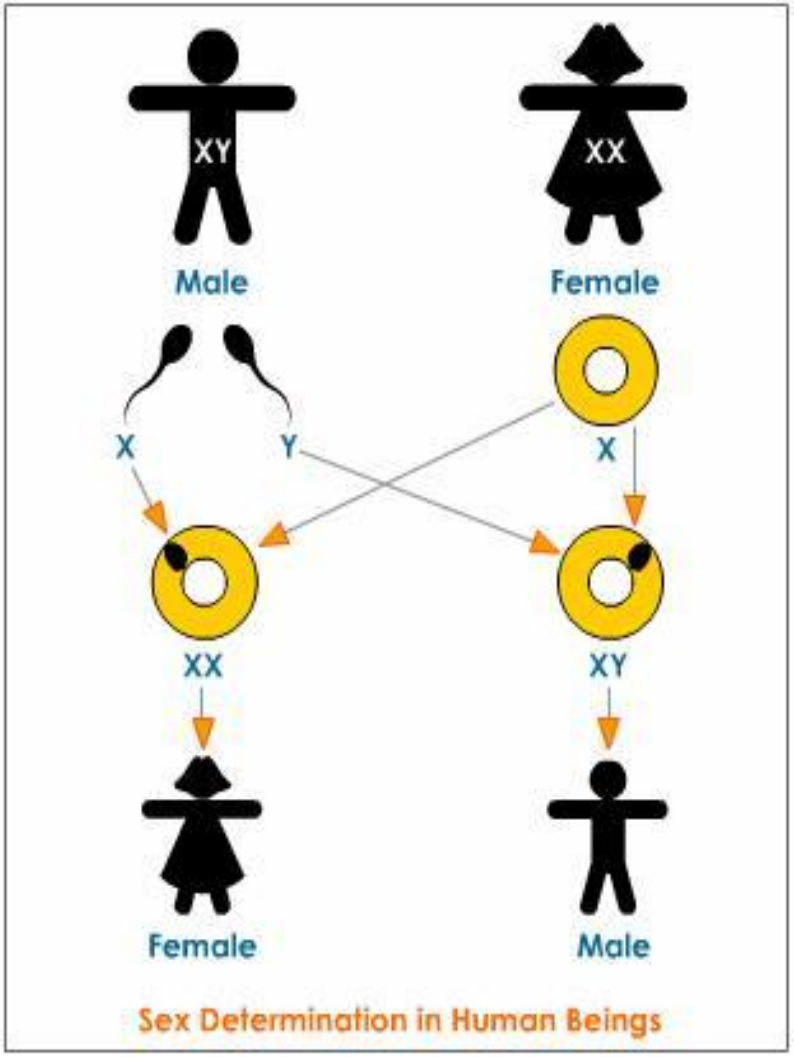
- 23rd pair is the **sex chromosomes**
  - Males = **XY**
  - Females= **XX**

- Sets **#1-22** are called **autosomes**
  - These determine the rest of the **traits**

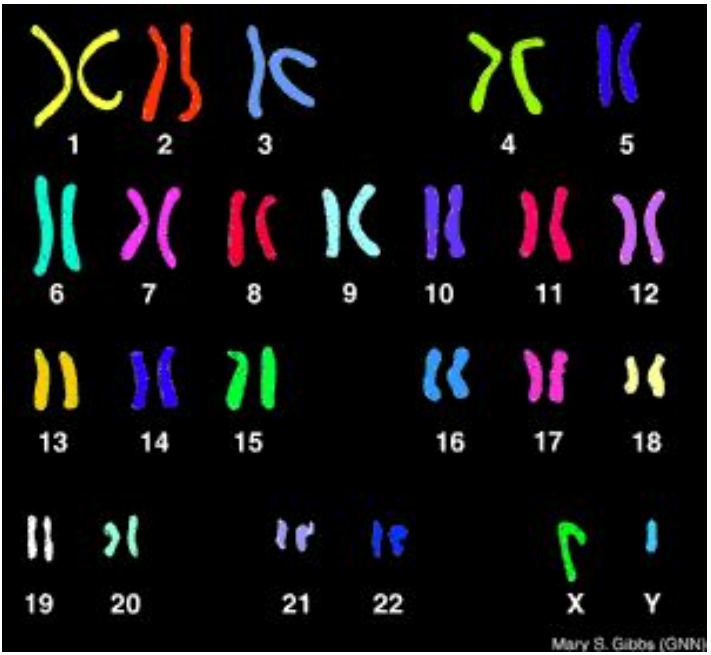


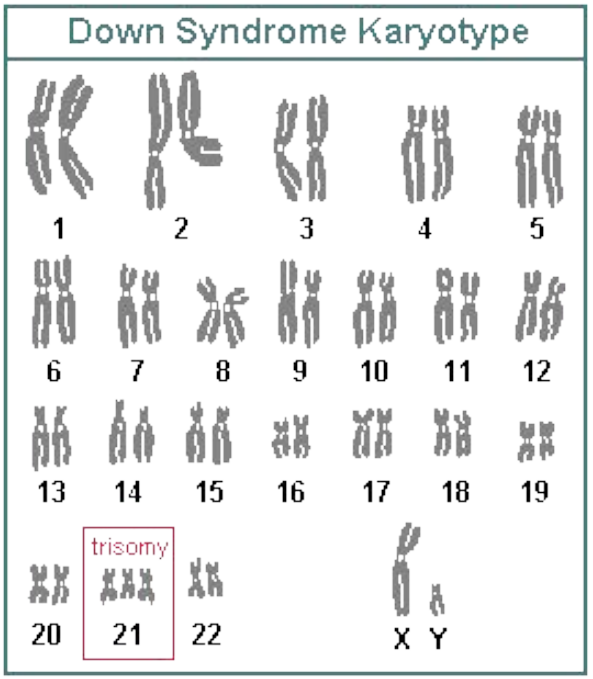
Sex Determination

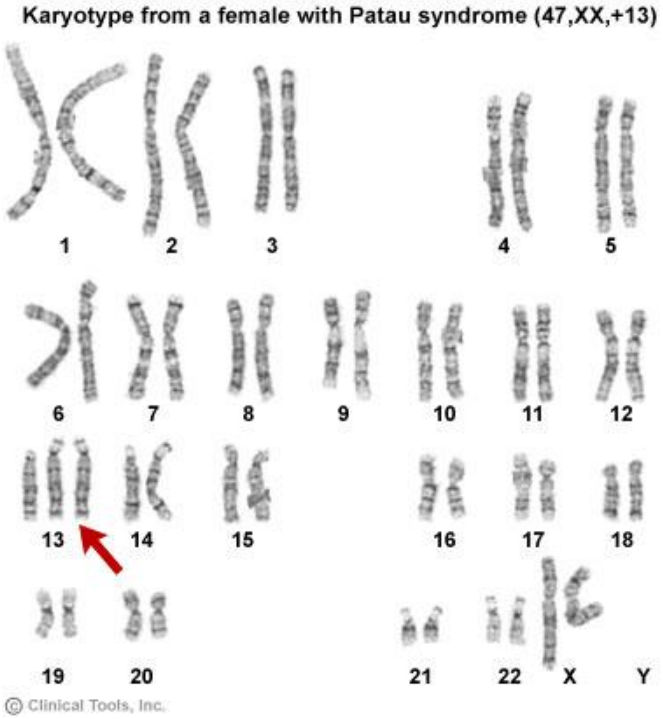
- Gender is determined by the sex chromosomes (#23 pair)
- Female = XX
- Male= XY
- Males determine gender of baby
  - Why?

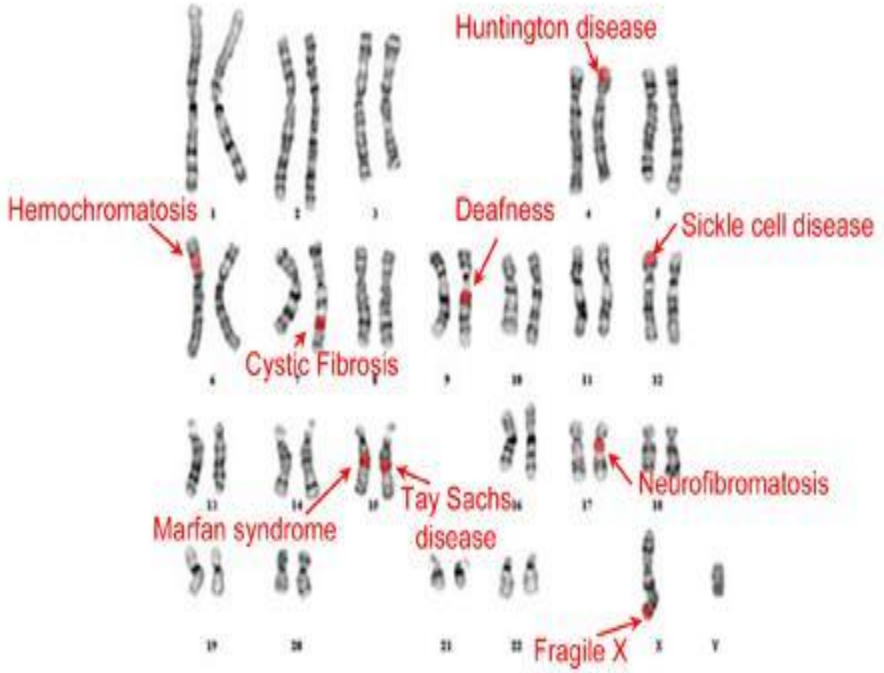


Karyotype examples



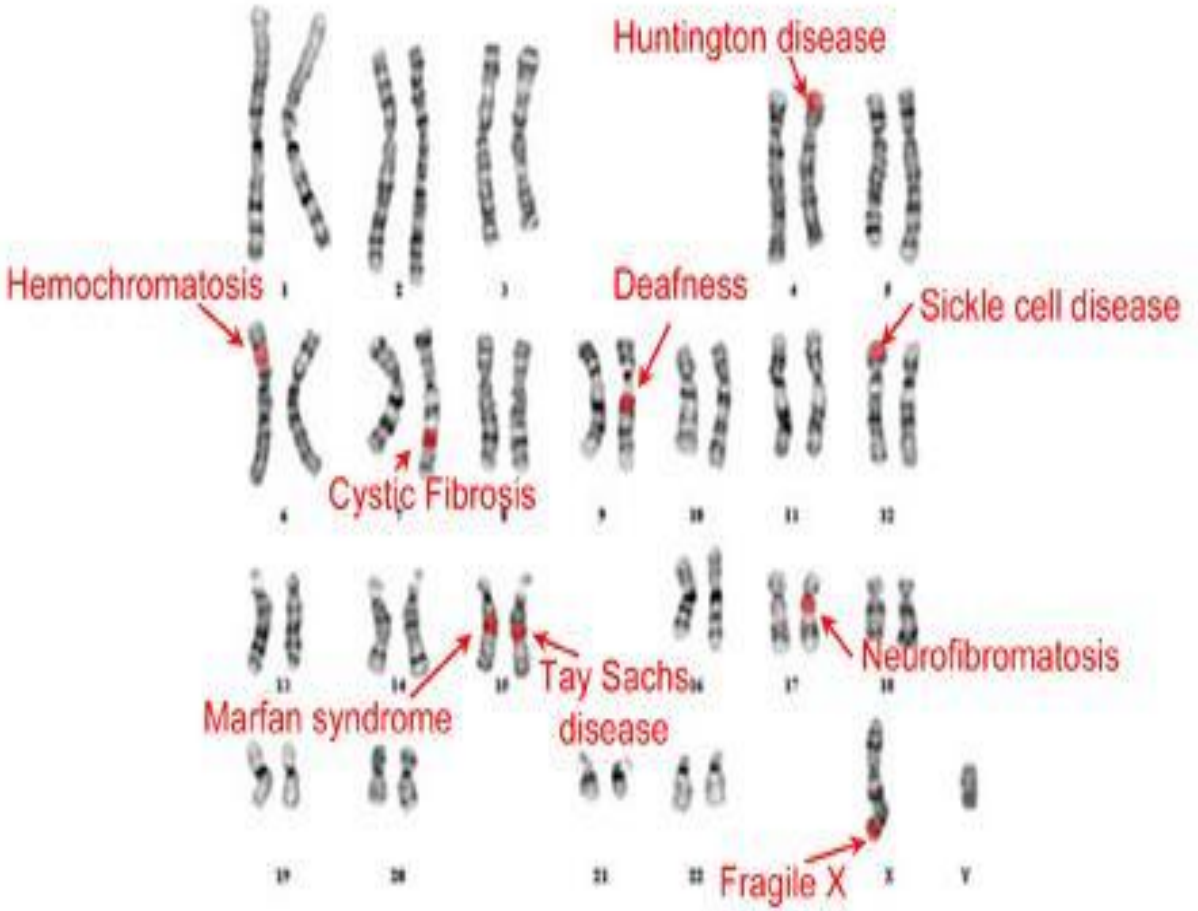






Karyotype Journal

- Answer all questions into your journal books



CARRIER

- an individual who is heterozygous for a trait
  ex: Yy, Tt, Rr, Bb
- Has 1 dominant allele that covers 1 recessive allele
  - Doesn't show the recessive trait since the dominant has overpowered it
  - They are "carrying" the trait to possibly pass it on to the next generation/offspring

Sex-Linked Traits

- Traits controlled on the "X" chromosome
- Males are most affected the most
  - Since they have only 1 X-chromosome
- Females less likely to get it
  - Have 2 X-chromosomes

- Examples: color blindness, hemophilia
- *How do you do a Punnett square properly??*
- *Let's practice* 😊

Practice of Sex-linked Traits

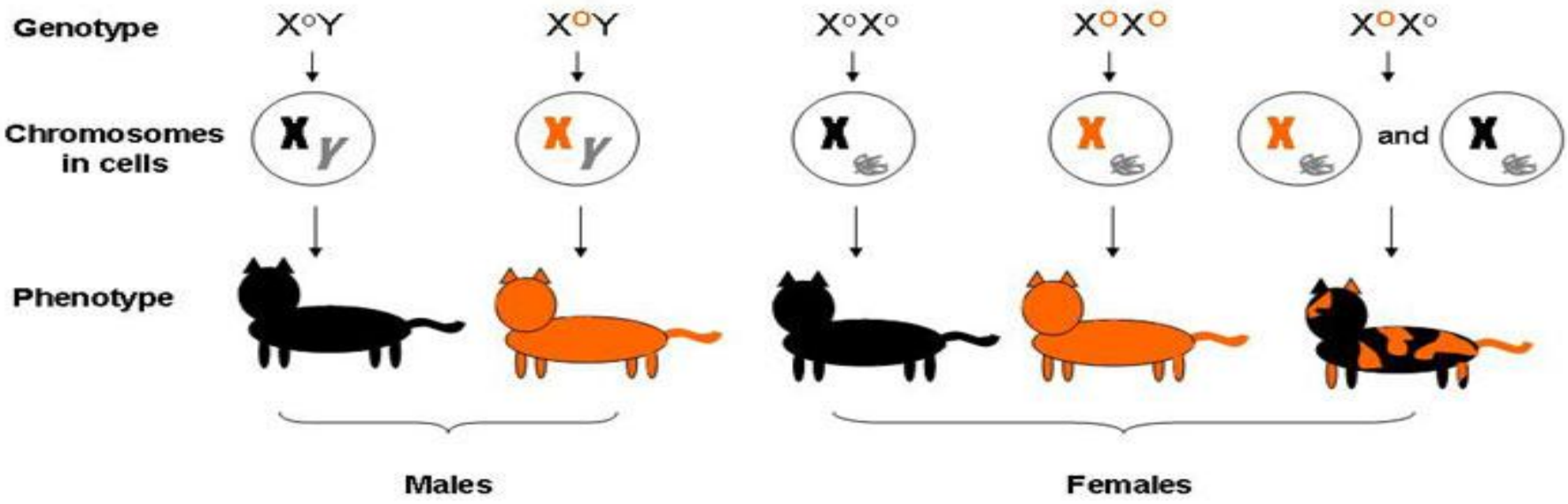
- Where do males get their X chromosome from?
- How do you write the genotype for a female with a sex-linked trait?
- How do you write the genotype of a male with a sex-linked trait?
- Cross a color blind male to a carrier female.
  - List the genotypes (male/female & colorblind)

Chromosome inactivation

- Female have 2 doses since they have two X-chromosomes
- X is necessary for development in males/females
- One X-chromosome will stop functioning
  - This creates a Barr body
- The "Y" chromosome continues to work determining male characteristics

Calico Cats

- This can affect the coat color of cats
- Example of <u>calico cats</u>
  - **Black color**= black on the X (either male or female)
  - **Orange color**= orange on the X (either male or female)
  - **Calico**= has 1 black and 1 orange
    - can only be a female cat

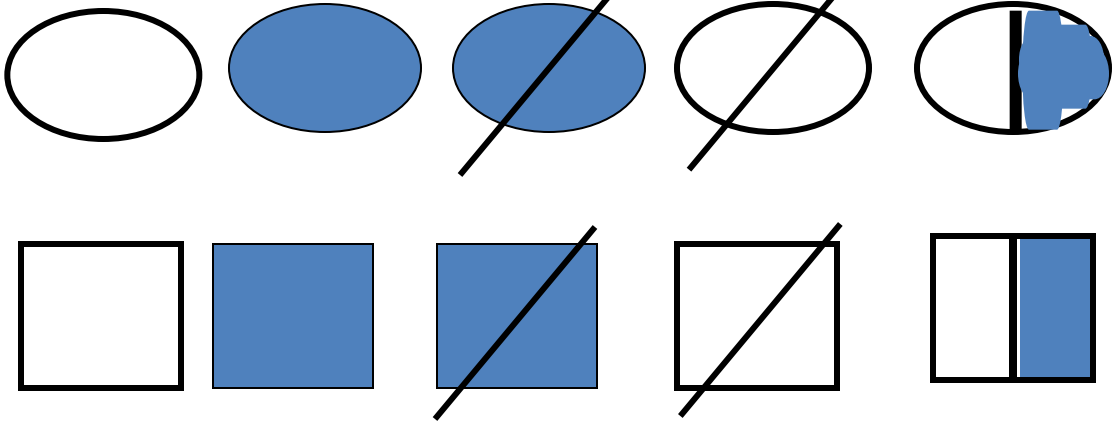


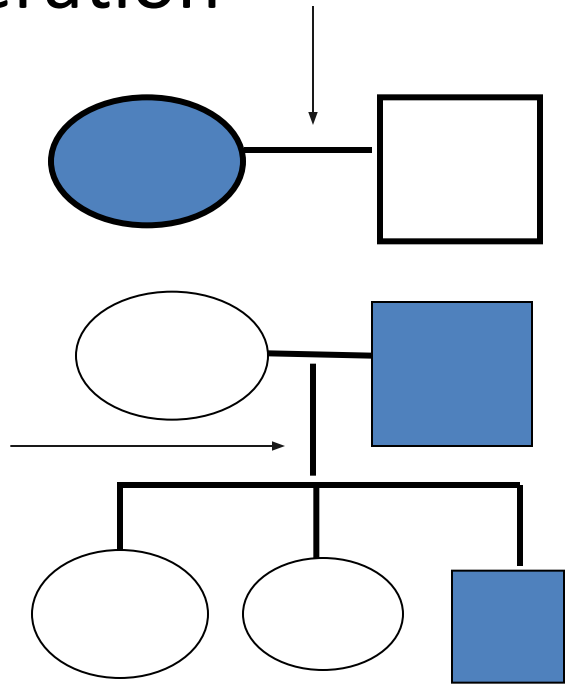
Pedigree

- A chart that shows the pattern of inheritance for a particular trait within a family
- **Dominant traits:** every generation (Male/female)
- **Recessive traits**: skips a generation
- **Autosomal traits**: trait is on chromosome #1-22
- **Sex-linked traits**: on the X chromosome (male)

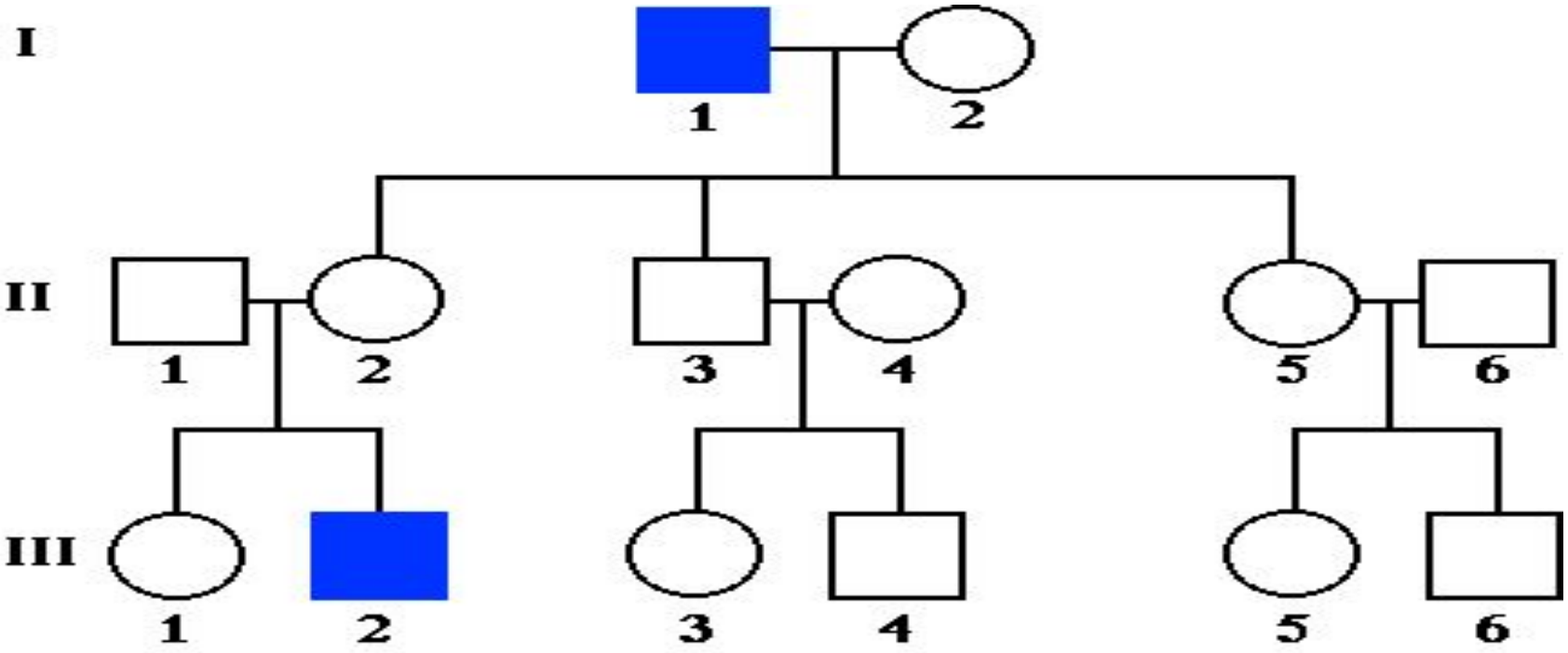
Pedigree

- What does each represent?
- **<u>Roman numerals</u>** stand for the generation number
- **<u>Numbers</u>** stand for the number of an individual in a particular generation





What type of Pedigree?



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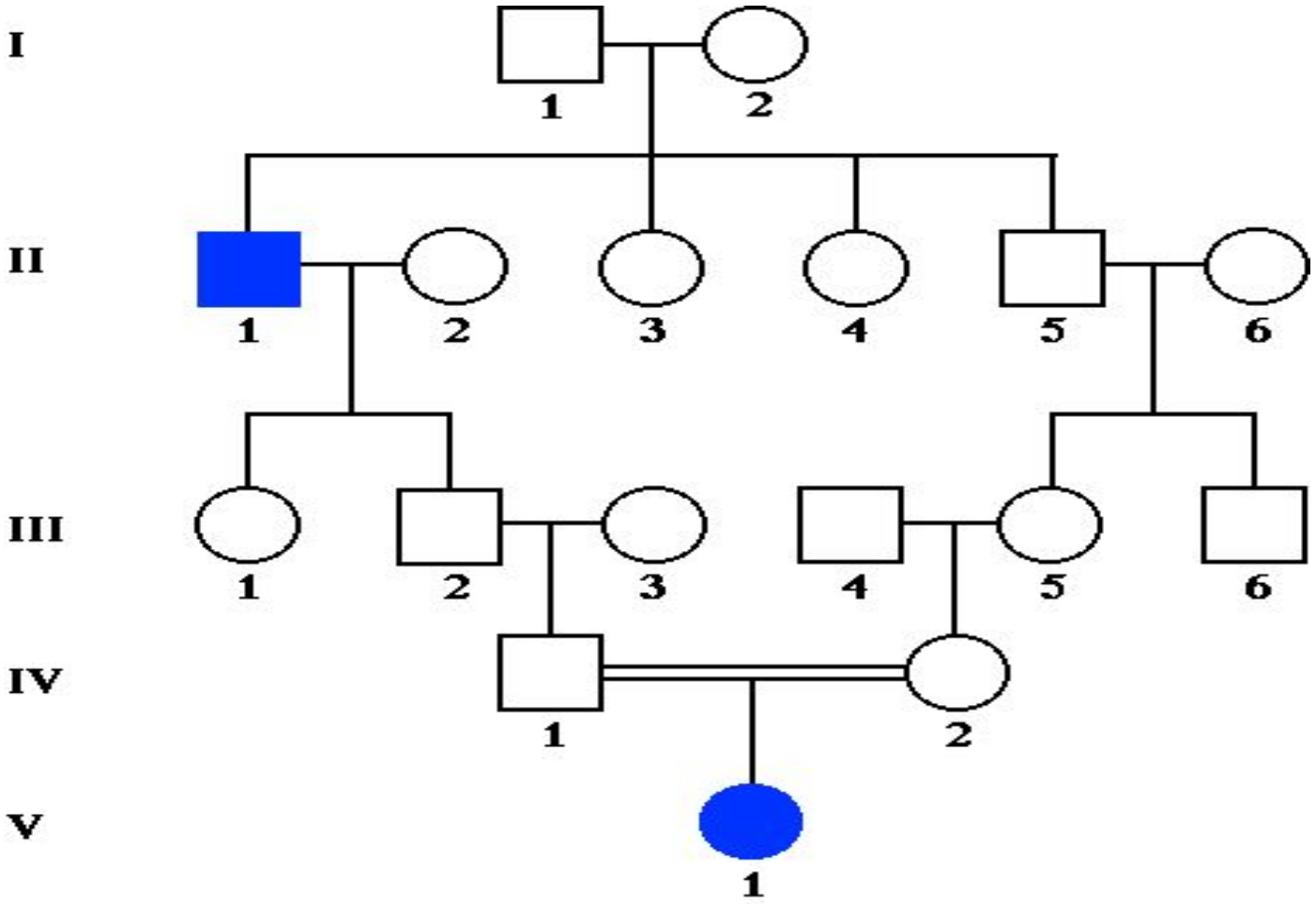

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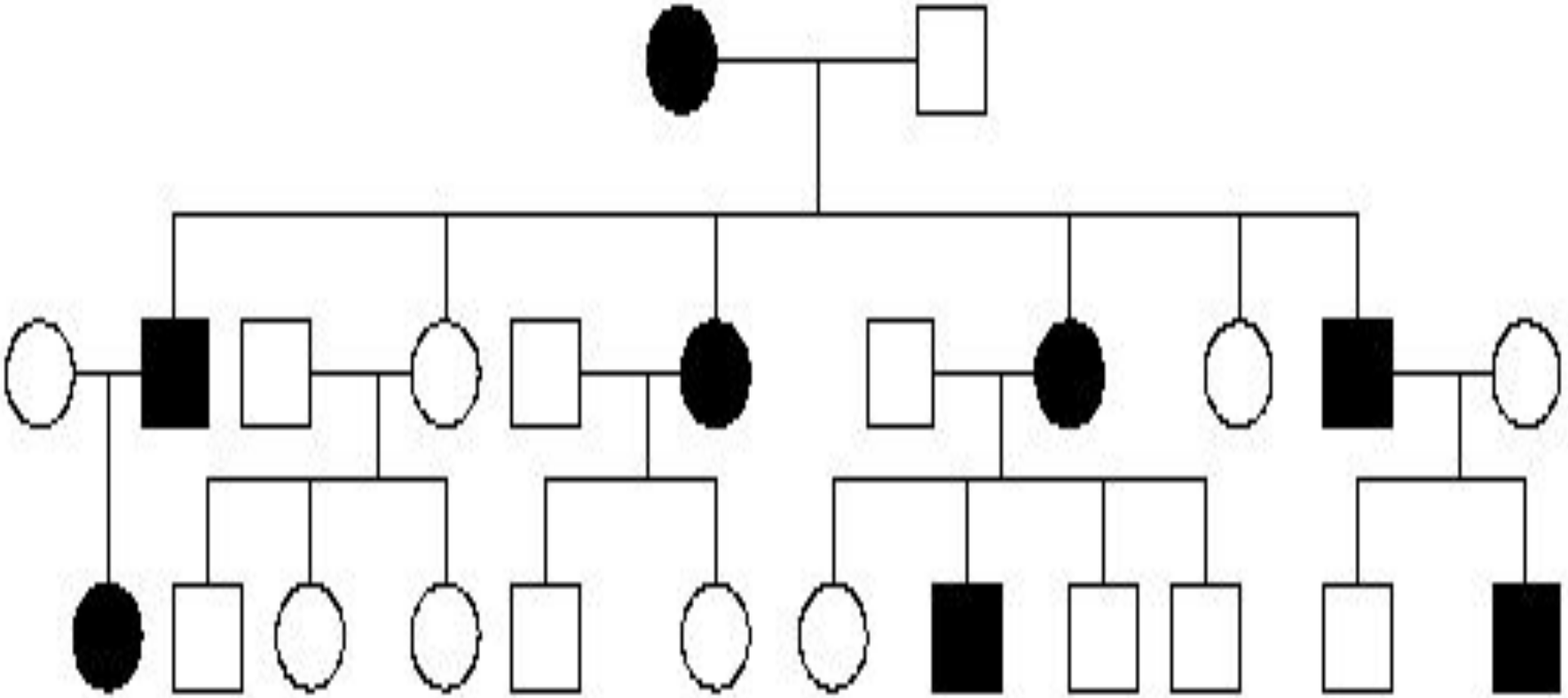
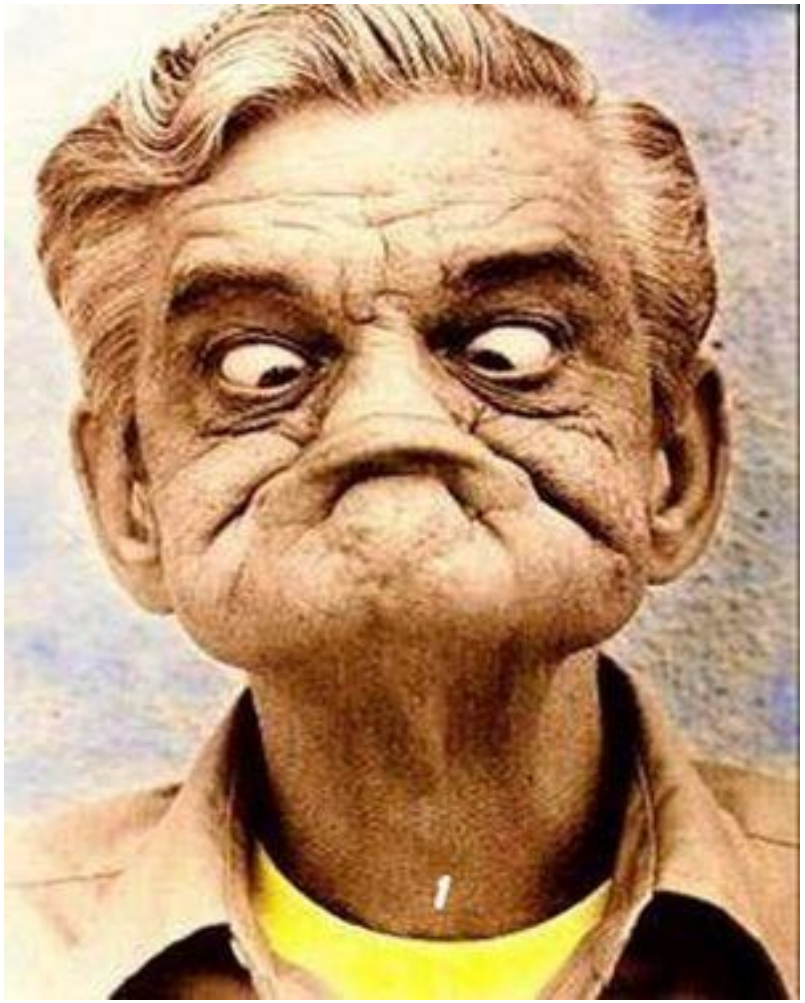


I AM MY OWN GRANDPA

- https://www.youtube.com/watch?v=zeIsxXDyjlc



Amoeba Sisters

- https://www.youtube.com/watch?v=Gd09V2AkZv4
  - Questions
    - A couple with the ability to taste PTC have 2 grown sons and 1 grown daughter. The sons have the ability to taste PTC. Their daughter is a PTC non-taster. She married a PTC non-taster man, and they have 2 sons. What is the genotype of the grandsons?

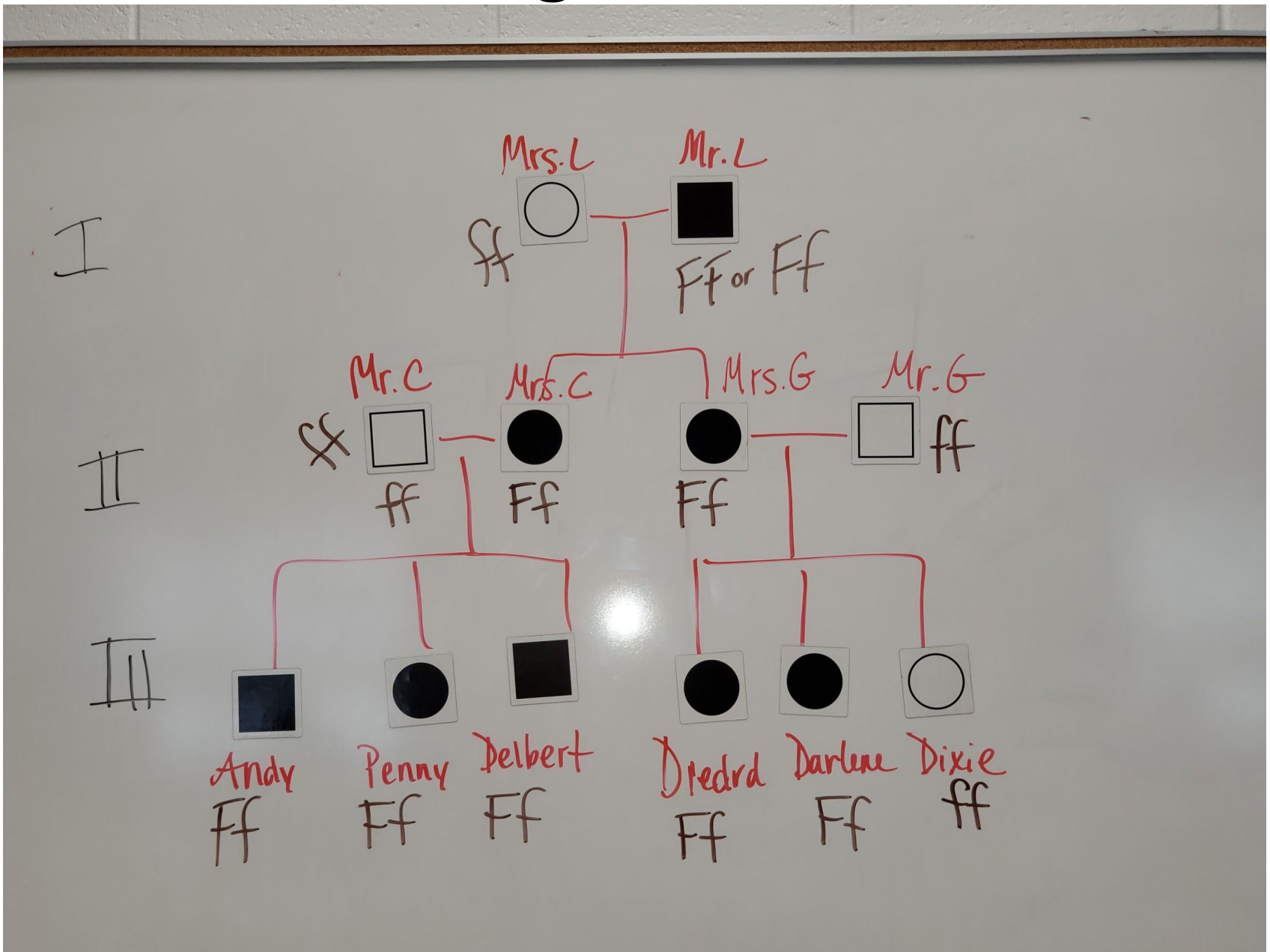
Pedigree Practice in Journals Pg 108

- Draw a pedigree showing a married couple with 4 kids, all boys?
- How would you draw a married couple with 2 kids, the daughter is married and has a son, the older brother is not married?
- How would you draw a family that has 2 boys and 2 girls, the girls are carriers, and only the boys are married? All of the 2 granddaughters (cousins) are carriers just like their grandmother.

Pedigree Lab

- Open up journals books (page 108/109) and let’s practice making some pedigree’s

Pedigree #2


I
II
III
Mrs. L
Mr. L
ff
Ff or Ff
Mr. C
Mrs. C
Mrs. G
Mr. G
ff
Ff
Ff
ff
Andy
Penny
Delbert
Diedra
Darlene
Dixie
Ff
Ff
Ff
Ff
Ff
ff

Homework

- Figure out Rudolph's family history of red-noses
- Since a Red nose is <u>recessive</u> and Black noses are dominant
  - Red Noses =
  - Black Noses=

<u>To do</u>

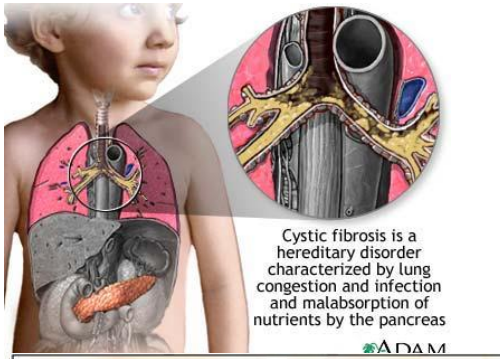
1. Complete the Symbol column (circles or squares)
2. Complete the pedigree on the back of his Family History (there should be 4 generations)
3. Don’t forget each reindeer’s name

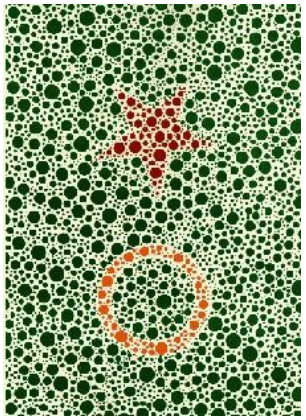
Pedigree Review Quiz

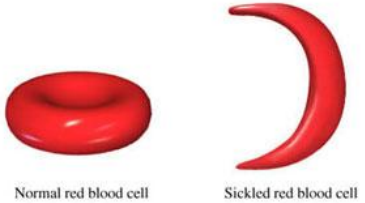
- Answer the questions onto page 110

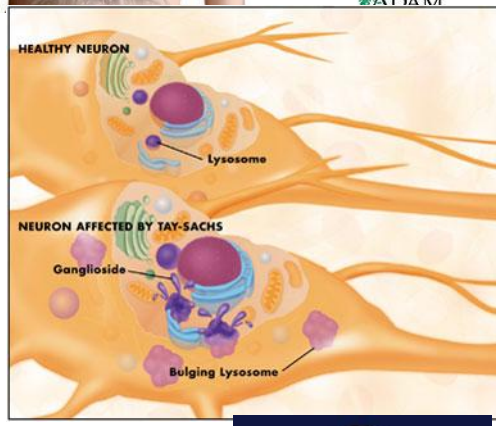
Genetic Disorders

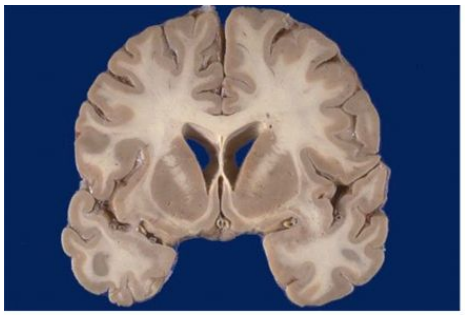
- Cystic Fibrosis
- Albinism
- Tay-Sachs Disease
- Huntington's Disease
- Achondroplasia
- Sickle cell anemia disease
- Hemophilia
- Color Blindness











Do you Remember?

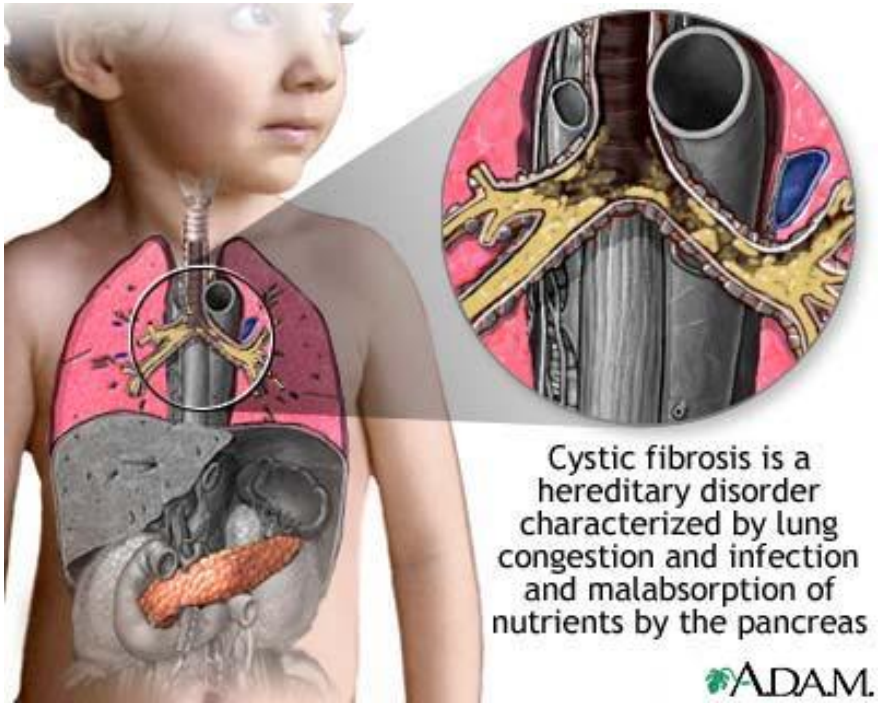
- What does it mean to have an autosomal trait?
- What does it mean to have a sex-linked trait?
- What is a dominant trait mean?
- What does a recessive trait mean?

DNA changes = human traits affected

- Changes in a gene's DNA sequence can change proteins by altering their sequences which directly affects their phenotype

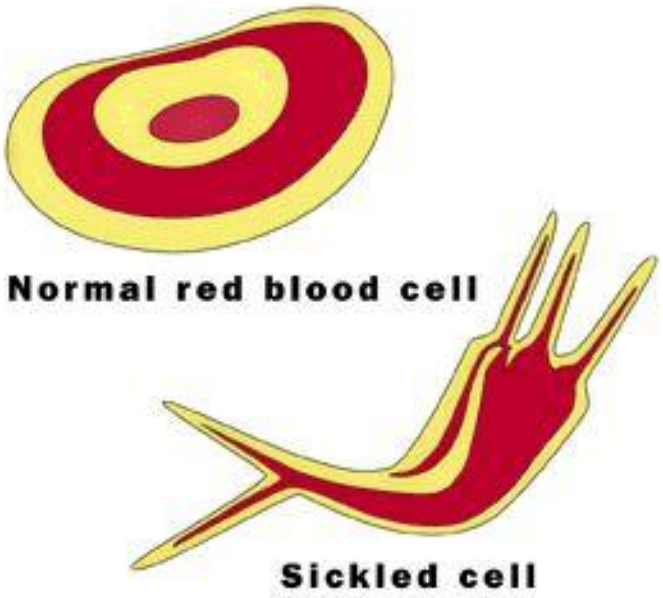
Cystic Fibrosis

- Caused by a defective gene that codes for a membrane protein
- Effect= Excessive mucus produced in lungs
- No cure
- Treatment includes drugs to clean out mucus
- Occurs primarily in the white population
- **Recessive**
- **Autosomal**



Sickle Cell Anemia Disease

- Cause= defective membrane protein
- Effect= RBC become sickle shaped
- No cure
- Treatment: blood transfusions
- Occurs usually in the African American population
- **Recessive**
- **Autosomal**

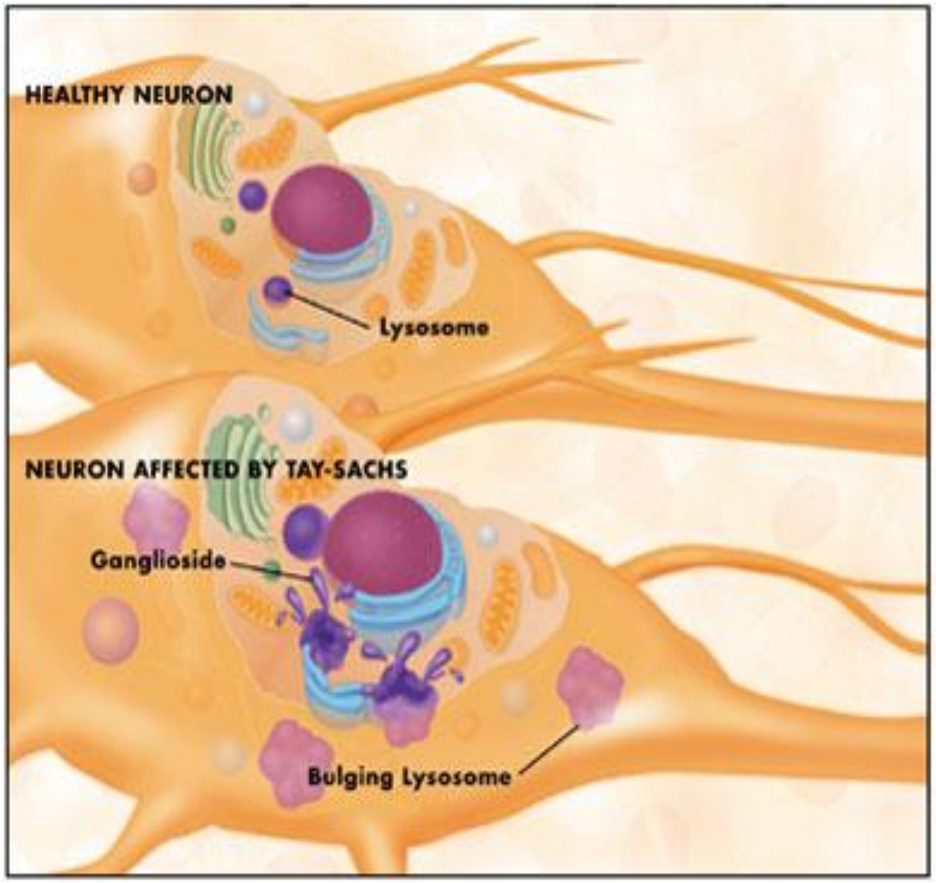


Huntington's Disease

- Cause= extra protein build up in brain
- Effect= Nervous system deteriorates during middle age
- No cure or treatment
- Death in middle age
- **Dominant**
- **Autosomal**

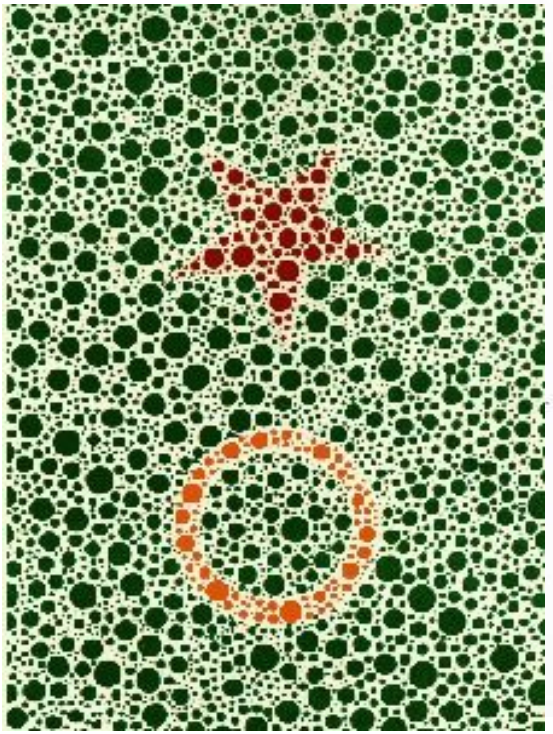
Tay-Sachs Disease

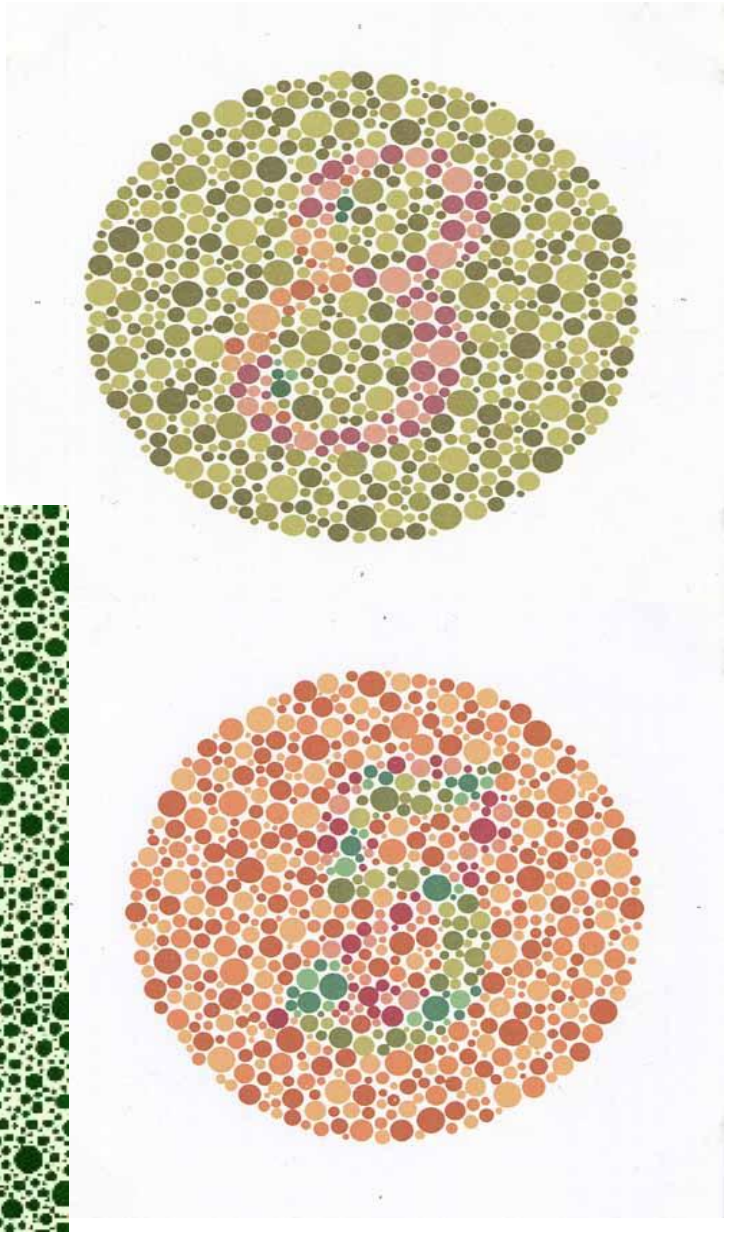
- Absence of a gene to break down fatty substances in brain
- **Effect**= Build-up of fatty deposits on brain
- Mental disabilities
- No cure or treatment
- Death by age 5
- Occur primarily in the Jewish population
- **Recessive**
- **Autosomal**



Color Blindness

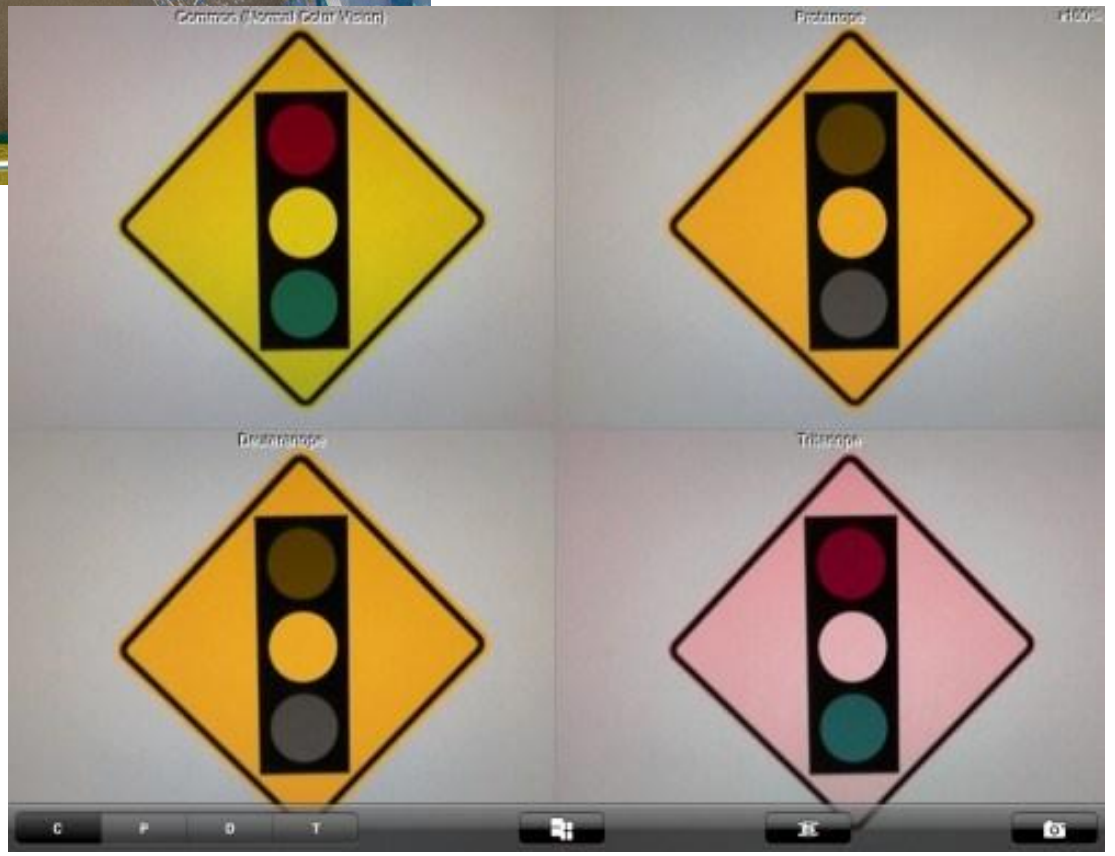
- Defect in cones of the eye
- Effect= Cannot see colors
- Occurs mostly in males
- **Recessive**
- **Sex-linked**






Normal Vision
STOP
DO NOT ENTER

Colorblindness
STOP
CANAAN HIGH SCHOOL


Protanope
Deuteranope
Tritanope

Hemophilia

- Gene defect with clotting blood
- Effect= Blood does not clot and can increase bleeding
- No cure
- Treatment: must take clotting factor VIII daily
- Effects males mostly
- **Recessive**
- **Sex-linked**

Achondroplasia

- A defective gene that affects bone growth
- Results in dwarfism
- Anyone
- **Dominant**
- **Autosomal**

Genetic Advantages

- Affects those homozygous for sickle cell
  - **NN** = normal cells
  - **SS** = sickle cells
  - **SN**= both sickle and normal cells together

Heterozygote is more resistant to malaria

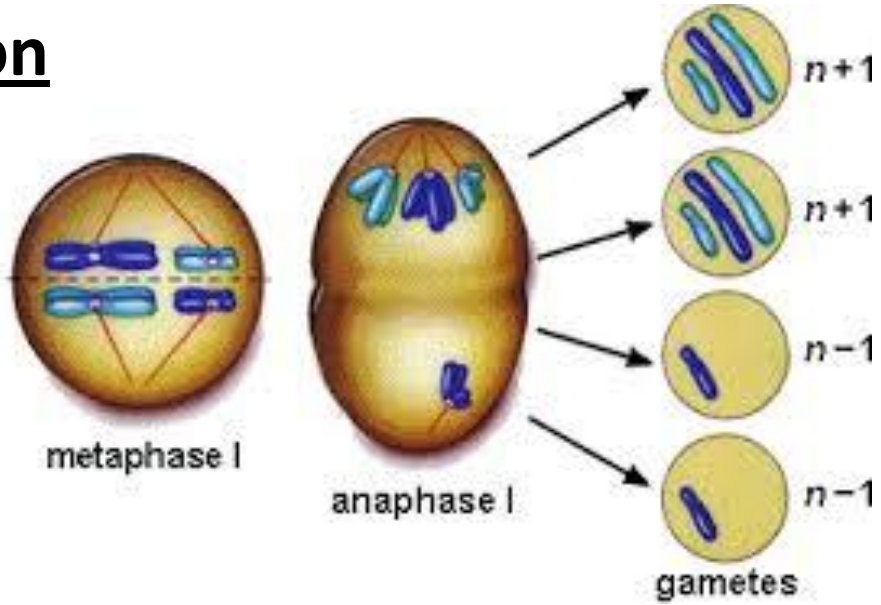
Genetic Advantages

- Cystic Fibrosis heterozygote
  - CC = normal
  - cc = has Cystic Fibrosis
  - Cc = normal but resistant to typhoid fever

Chromosomal Disorders

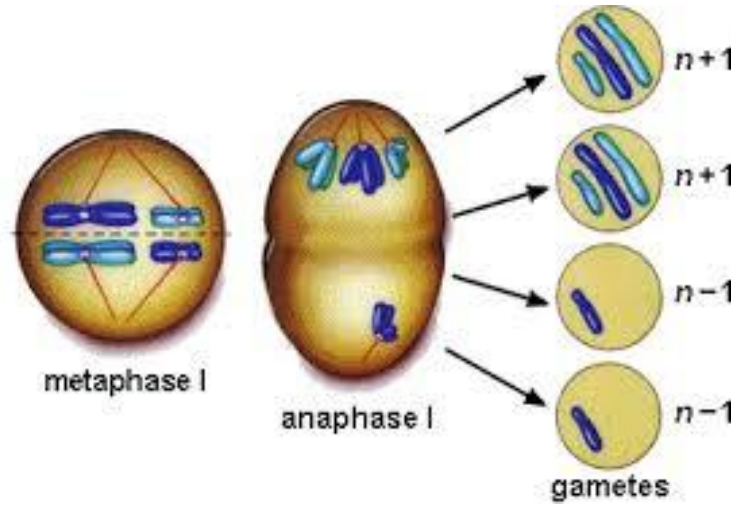
- Means an error in **Meiosis**
- Each human **gamete** should have **23** chromosomes
- But what happens if the **homologous** chromosomes do **NOT** separate correctly

  – This is called **Non-disjunction**



Non-disjunction

- A **gamete** with an **abnormal** number of chromosomes leading to a **disorder** of **chromosome** number
- The gamete will have 1 copy of a chromosome
  - Example: Turner's Syndrome
    - A female with only 1 X-chromosome

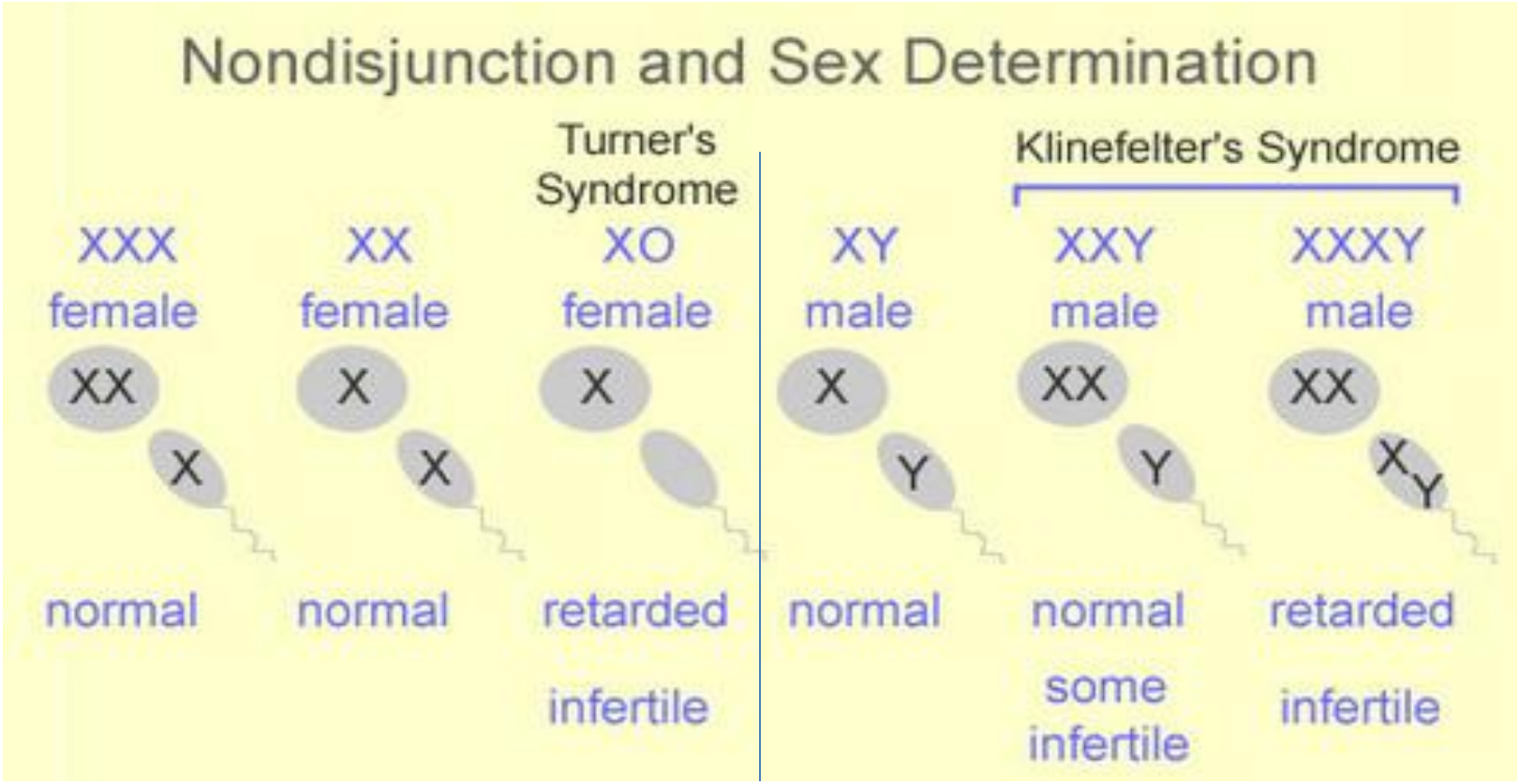


Down Syndrome

- Gamete could have 3 copies of a chromosome
- This is called Trisomy
- Example: Down Syndrome
  - 3 copies of #21 chromosome

- Example: Klinefelter's Syndrome
  - A male who has XXY sex chromosomes

Non-disjunction in sex chromosomes



Studying the Human Genome

- **Human Genome Project**
  - 13 year international effort
  - Sequence all of the 3 billion base pairs of Human DNA
  - This would identify ALL human genes
  - Completed in 2003
  - Helps us to locate diseases and disorders
  - Someone can know their exact genetic make-up and what they can pass on to their offspring

Human Genome