Dominance and Multiple Allele Notes

http://www.dobermann-review.com/info/genetics/mendels_genetic_laws/Gregor%20Mendel.jpg

http://faculty.pnc.edu/pwilkin/incompdominance.jpg

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Snapdragons

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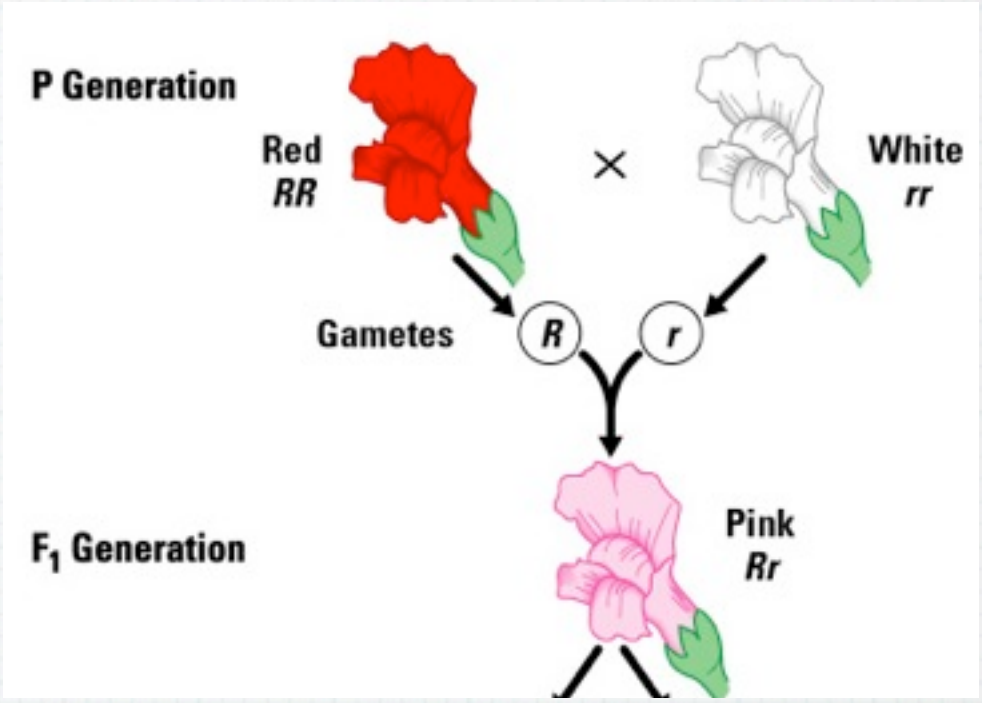

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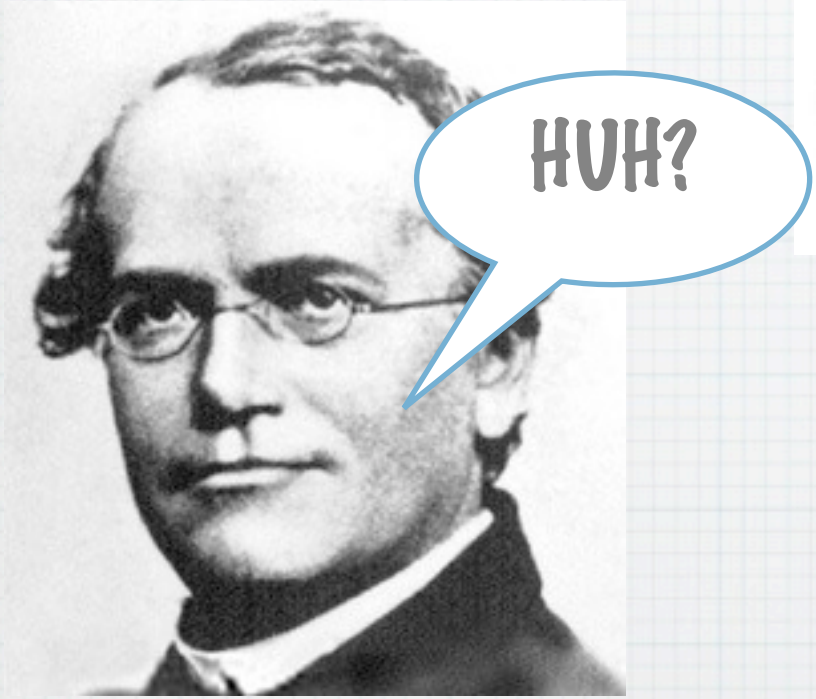

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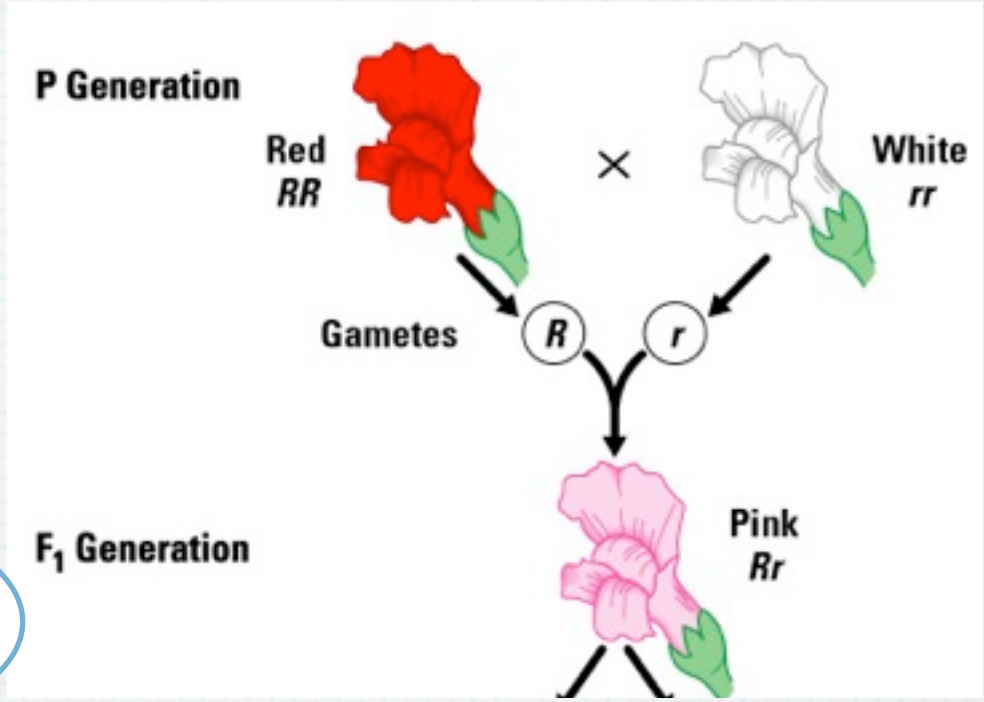

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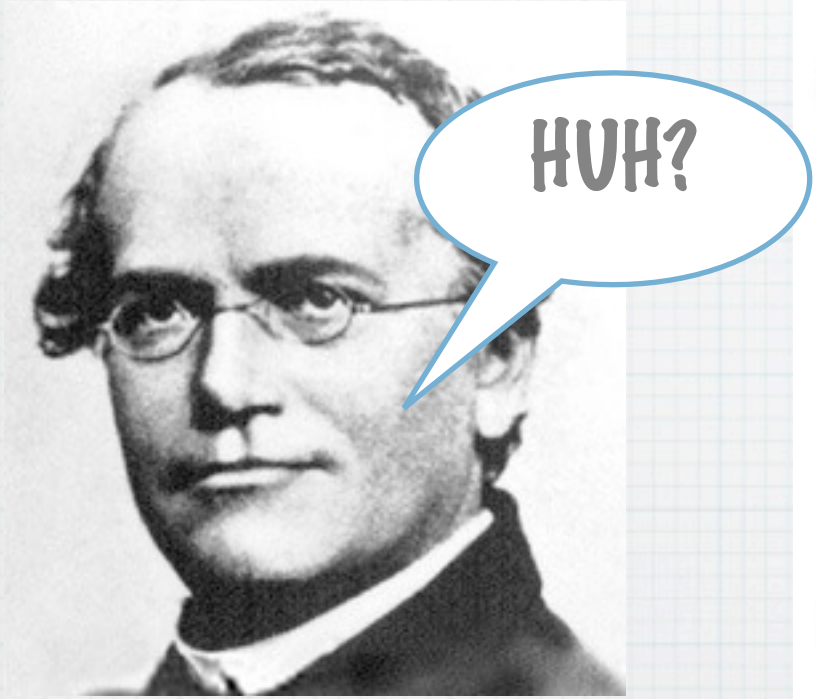

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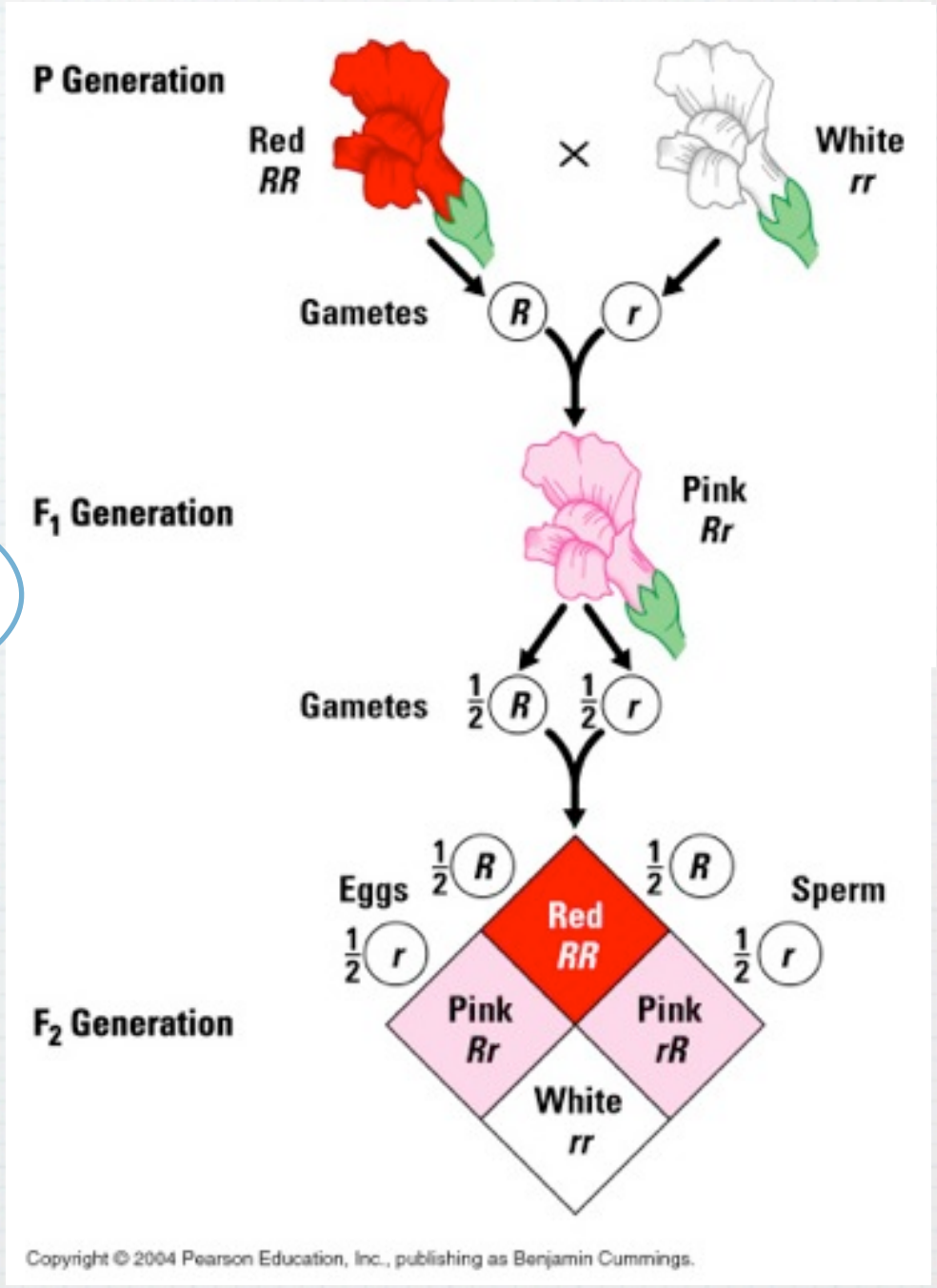

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Incomplete Dominance

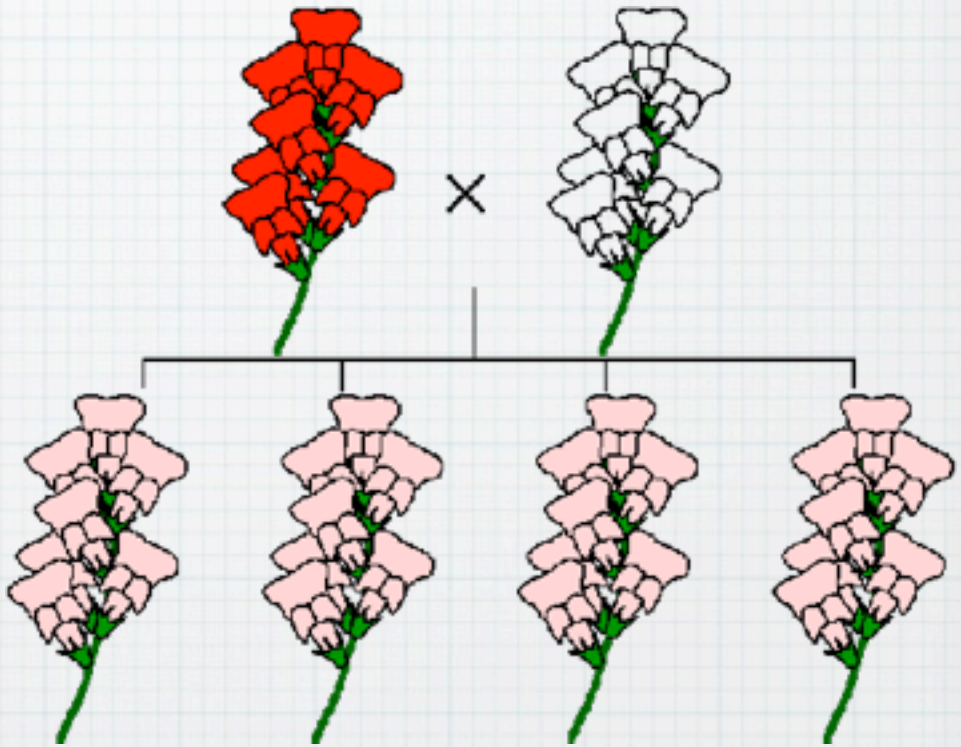
Incomplete dominance – When the alleles are blended and the offspring have a mix of their parent traits.

ex. Snap Dragons

R = red

r = white

Offspring can be pink!



Hair Texture

Hair Texture

Hair Texture

Animal Fur

Codominance

Heterozygous genotype

Codominance – in this case both alleles are expressed.

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BB= black corn

YY= yellow corn

BY = black and yellow corn

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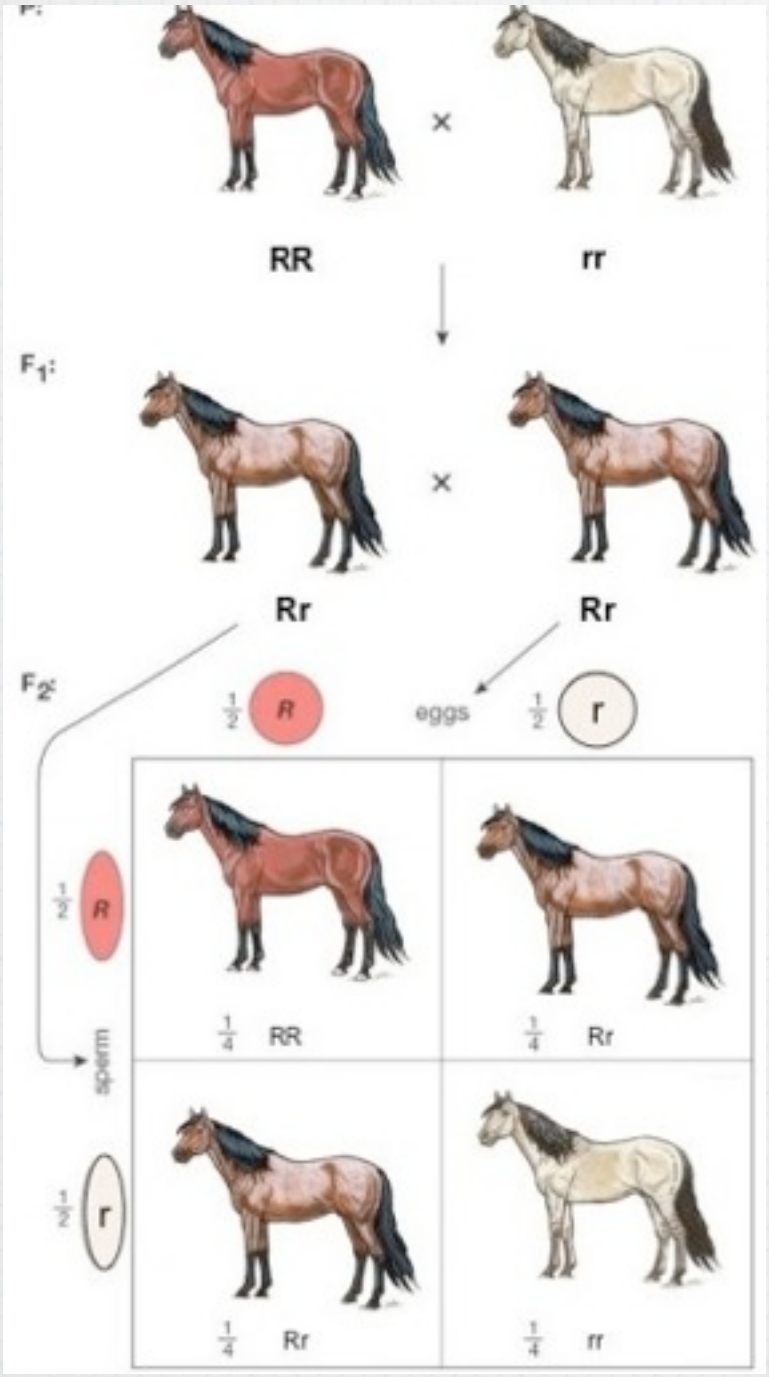
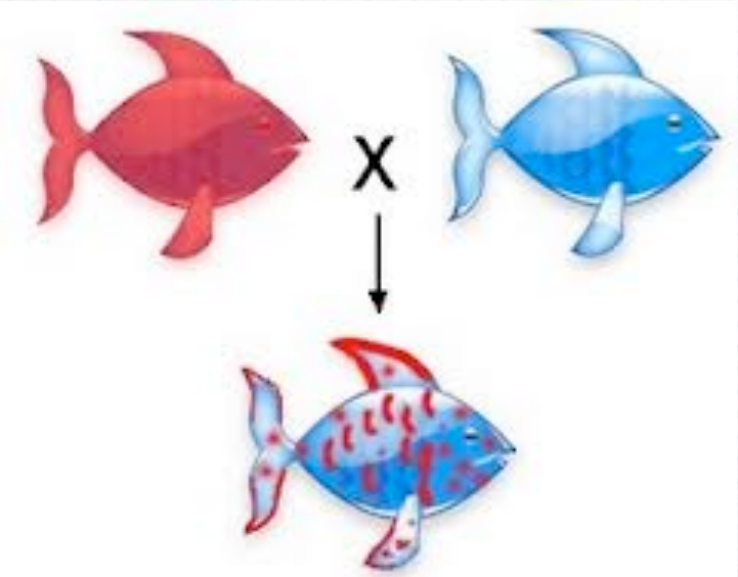


Roan Horse

http://search.yadlo.com/b/q?rel=2&keys=Dominance+Incomplete+Dominance+Codominance+PPT

Fish



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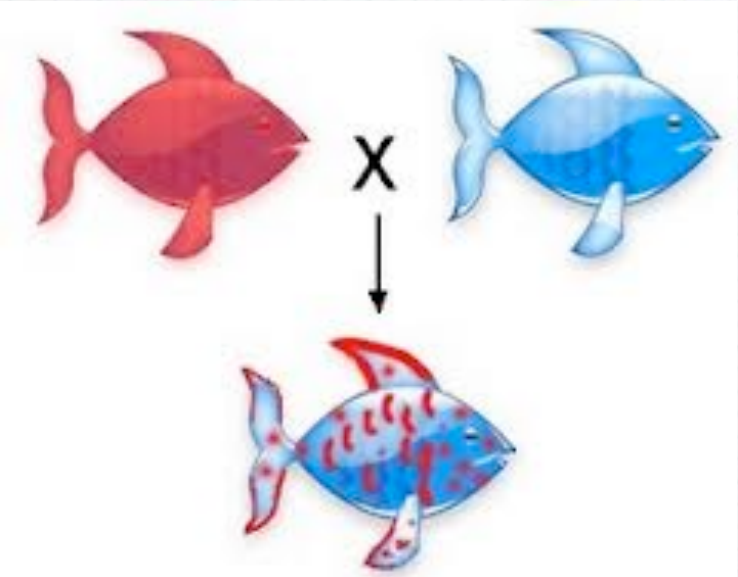

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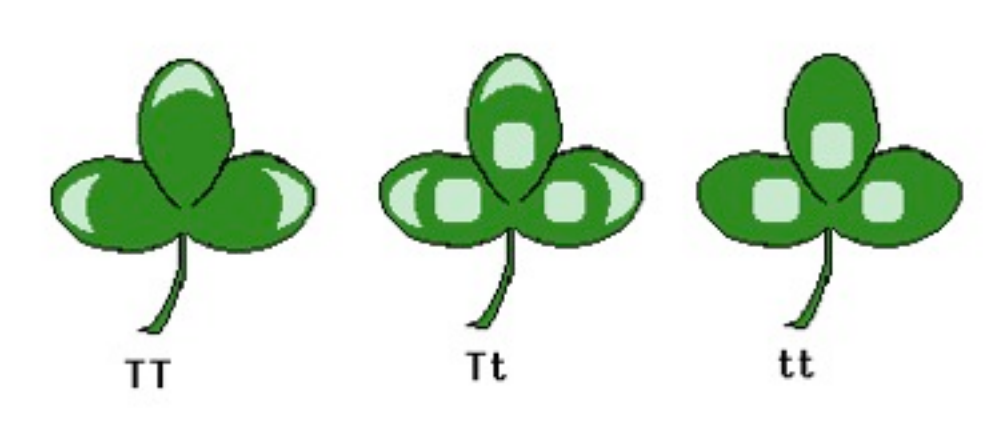
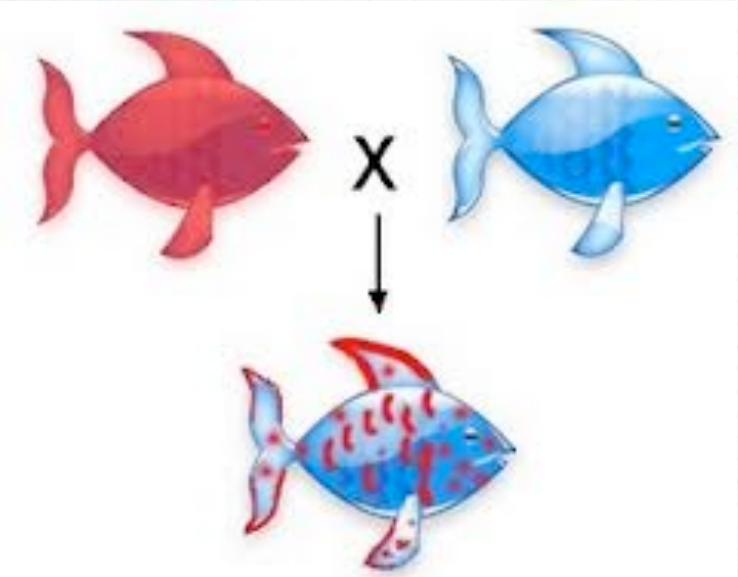
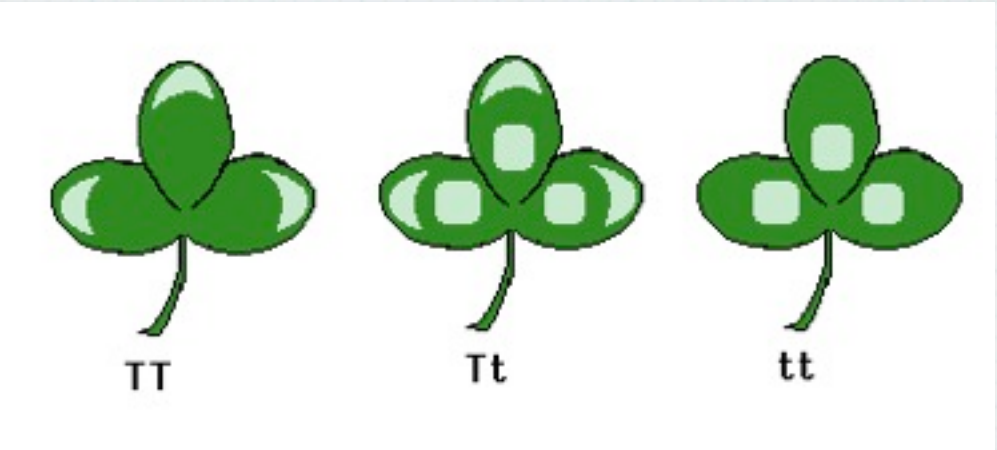




Fish

Variegated Clover



Incomplete Dominance or Codominance?

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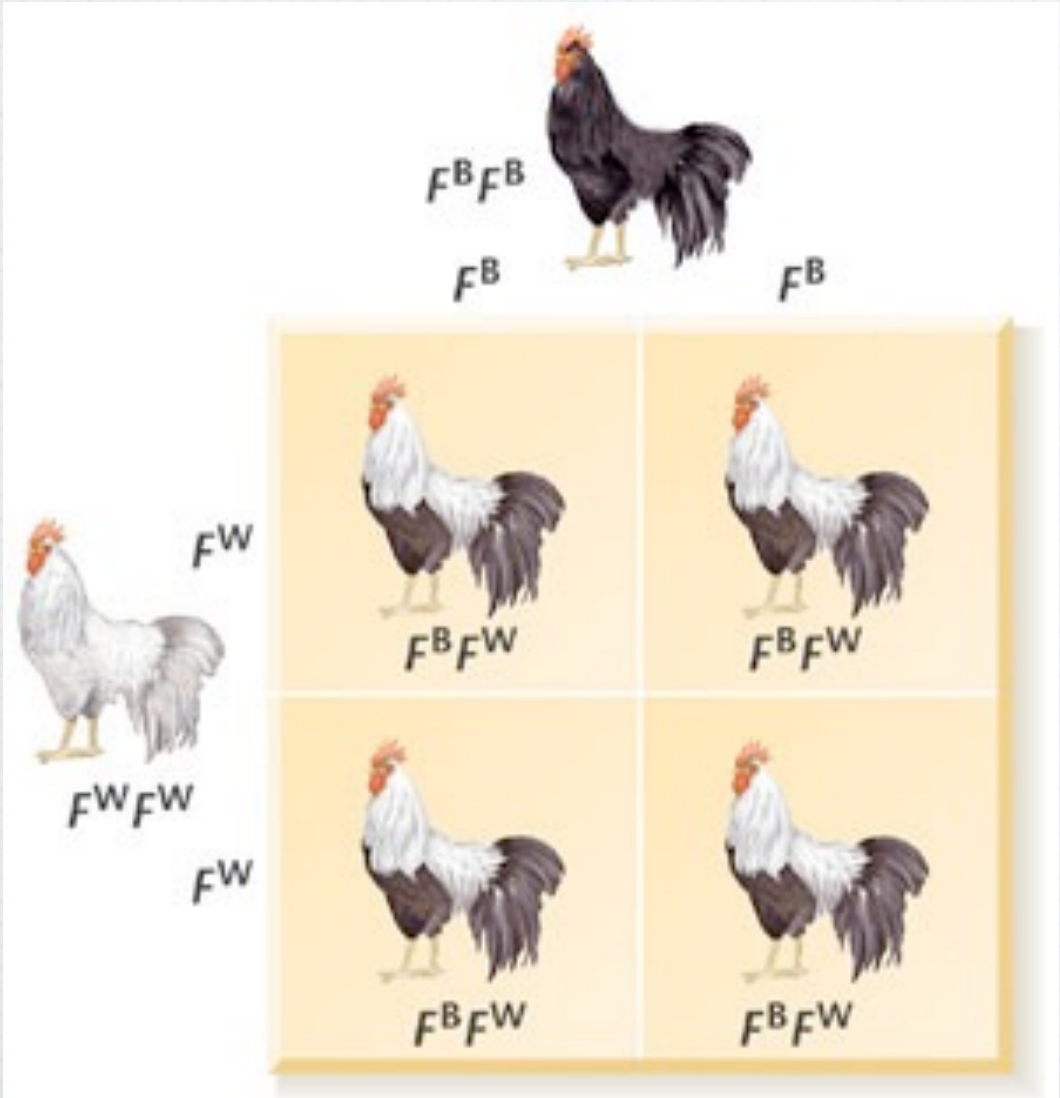
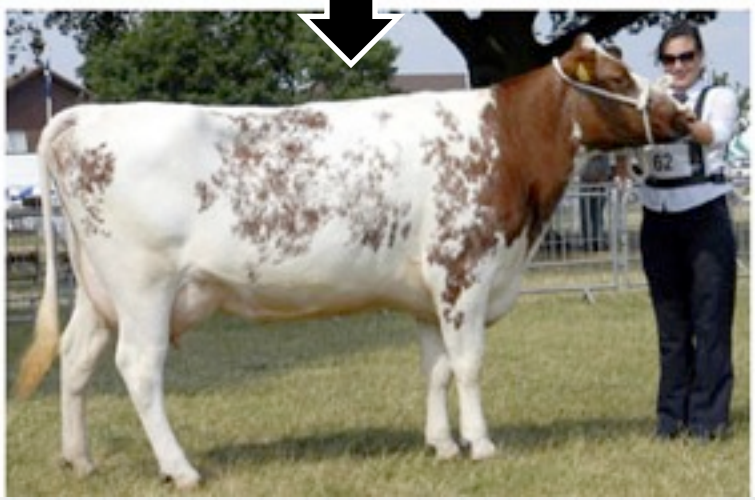


Incomplete Dominance or Codominance?

Roan Cow

Incomplete Dominance or Codominance?



Roan Cow

Incomplete or Codominance?

Incomplete or Codominance?

Is that it?

Is that it?

* Nope! There are also cases where there are many alleles that influence a trait!

Polygenic Traits

- A polygenic trait is determined by **multiple genes.** (poly=many, genic=genes)

Example: eye color and height

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Multiple Alleles

Karyotype

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Remember:

- Chromosomes occur in pairs.

(homologous pairs)

Multiple Alleles

Karyotype

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- The different alleles of a gene occupy the same positions on each chromosome

Multiple Alleles

So far each gene we have discussed has been made of two possible alleles.

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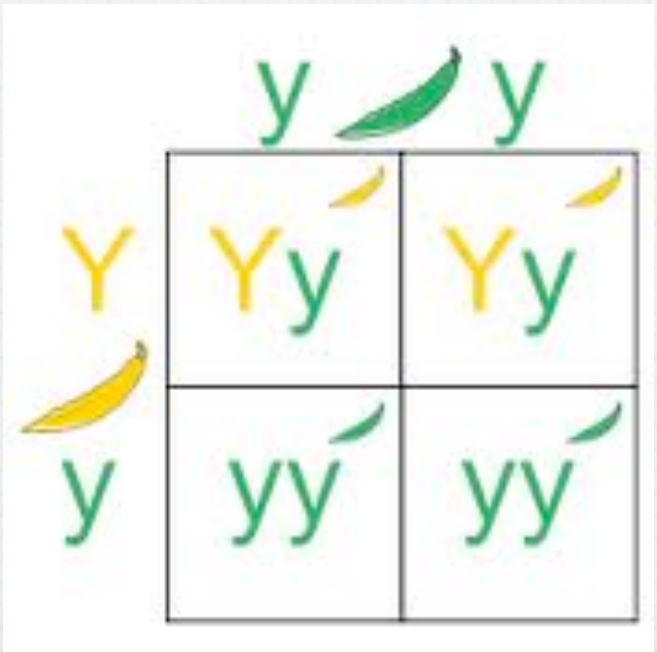
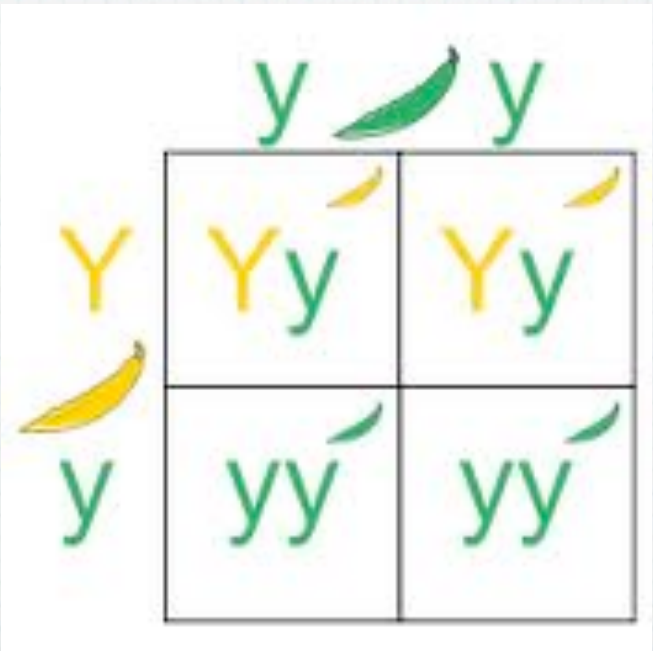


Multiple Alleles

So far each gene we have discussed has been made of two possible alleles.

Ex. Y = Yellow y= green



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However, it is possible to have several different allele possibilities for one gene.

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Possible genotypes	$C C$, $C c^{ch}$, $C c^{h}$, $C c$	$c^{ch} c^{ch}$	$c^{ch} c^{h}$, $c^{ch} c$	$c^{h} c^{h}$, $c^{h} c$	cc
Phenotype	Dark gray	Chinchilla	Light gray	Himalayan	Albino

Multiple Alleles

In traits with multiple alleles, each individual can carry any two of the several possible alleles.

Ex. BLOOD TYPE

The gene for blood type has 3 possible alleles.

I^A, I^B, and i

Blood Type

In this case both A and B are dominant to O (recessive).

A and B are codominant (both expressed)

So... there are four human blood types

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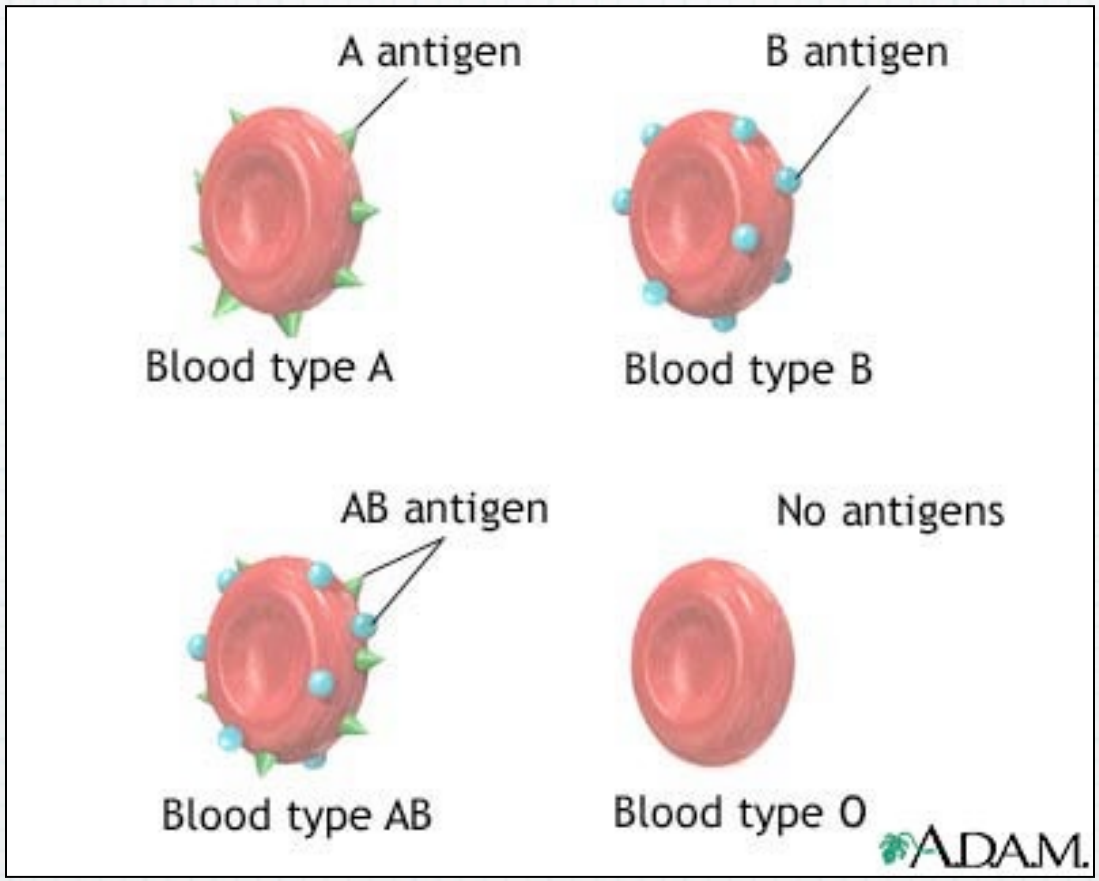
Genotype	Phenotype
I^AI^A, I^Ai	Blood type A
I^BI^B, I^Bi	Blood type B
I^AI^B	Blood type AB
ii	Blood Type O

Blood Type


A antigen
B antigen
Blood type A
Blood type B
AB antigen
No antigens
Blood type AB
Blood type O
A.D.A.M.

Rh Factors

Scientists sometimes study **Rhesus monkeys** to learn more about the human anatomy because there are certain similarities between the two species. While studying Rhesus monkeys, a certain blood protein was discovered. This protein is also present in the blood of some people. Other people, however, do not have the protein.

The presence of the protein, or lack of it, is referred to as the Rh (for **Rhesus**) factor.

If your blood does contain the protein, your blood is said to be Rh **positive** (Rh+). If your blood does not contain the protein, your blood is said to be Rh **negative** (Rh-).

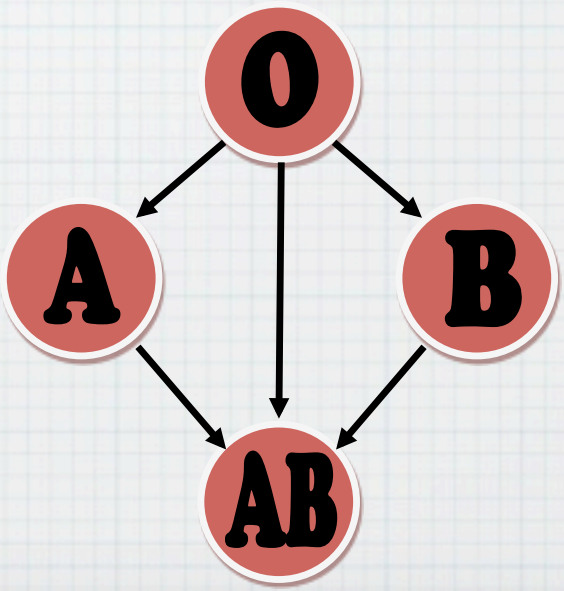
A+ A-
B+ B-
AB+ AB-
O+ O-

Who can give you blood?

People with **TYPE O** blood are called **Universal Donors,** because they can give blood to any blood type.

People with **TYPE AB** blood are called **Universal Recipients,** because they can receive any blood type.

Rh + Can receive + or -
Rh - Can only receive -

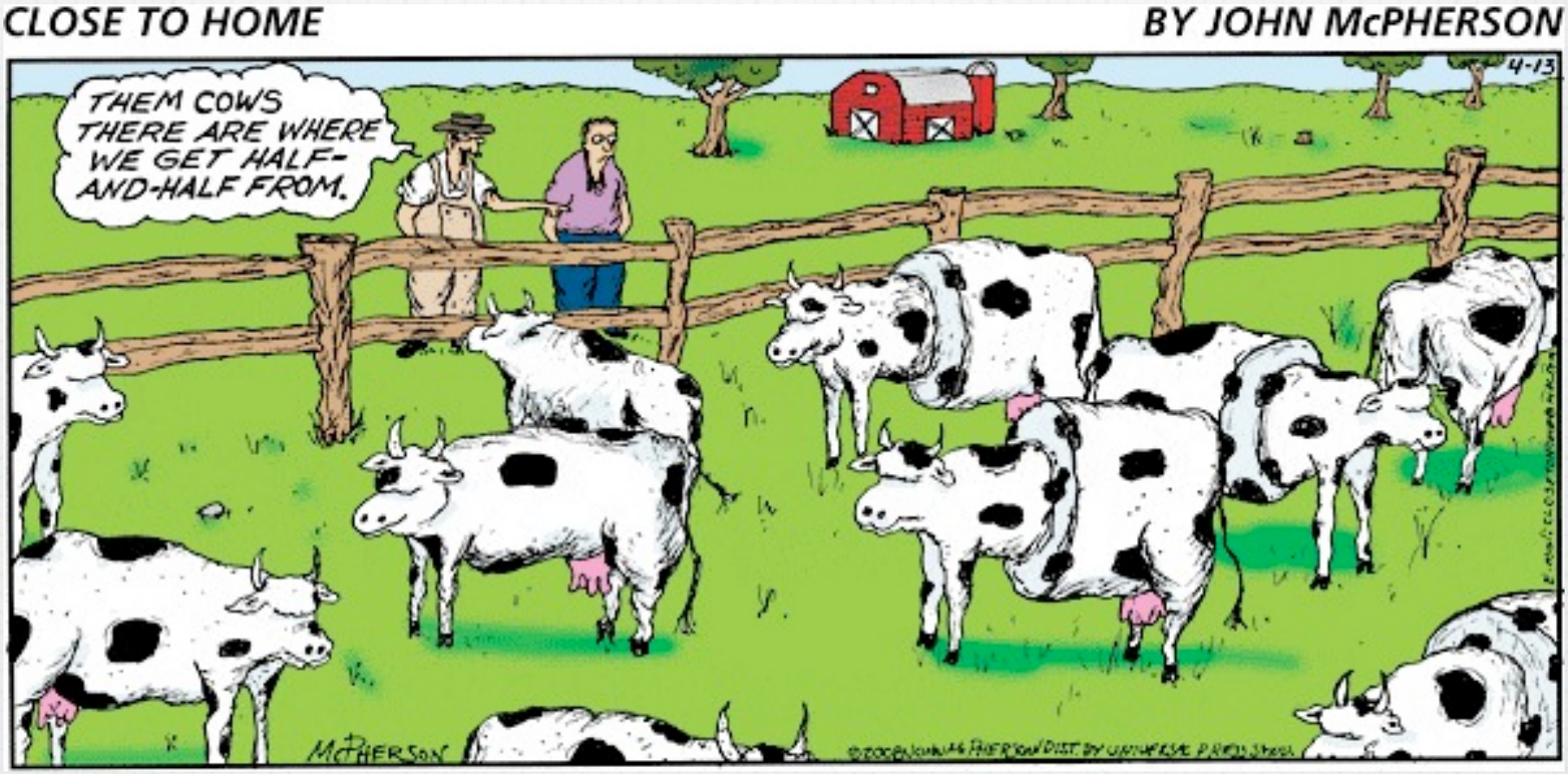


How common is your blood type?

TYPE	DISTRIBUTION	RATIOS	
O +	1 person in 3	38.4%	46.1%
O -	1 person in 15	7.7%	
A +	1 person in 3	32.3%	38.8%
A -	1 person in 16	6.5%	
B +	1 person in 12	9.4%	11.1%
B -	1 person in 67	1.7%	
AB +	1 person in 29	3.2%	3.9%
AB -	1 person in 167	0.7%	

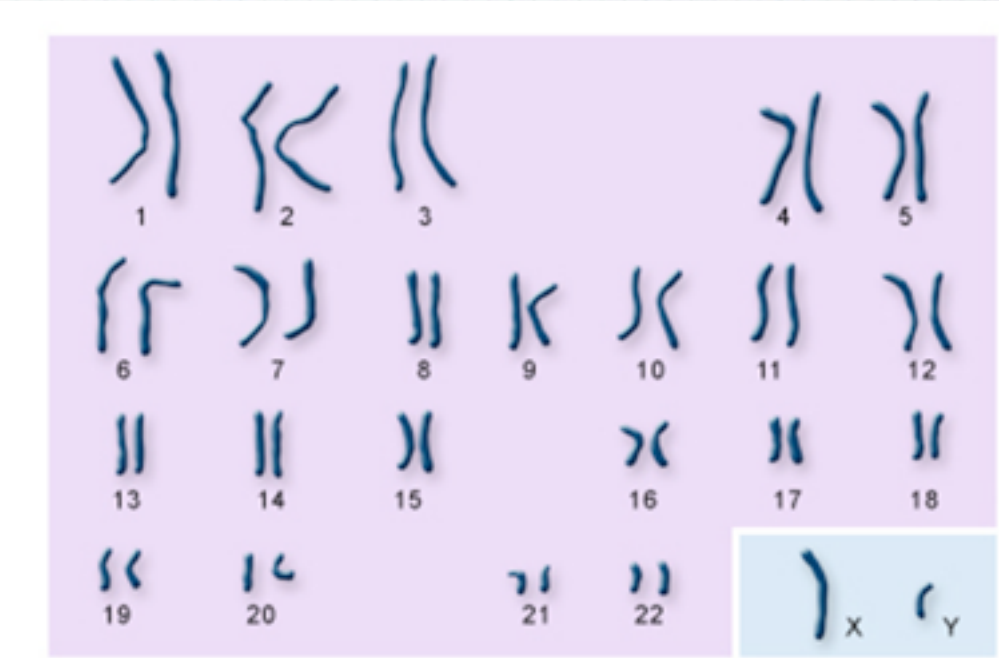
http://www.bloodbook.com/type-facts.html

Sex-Linked Traits



Sex Chromosomes

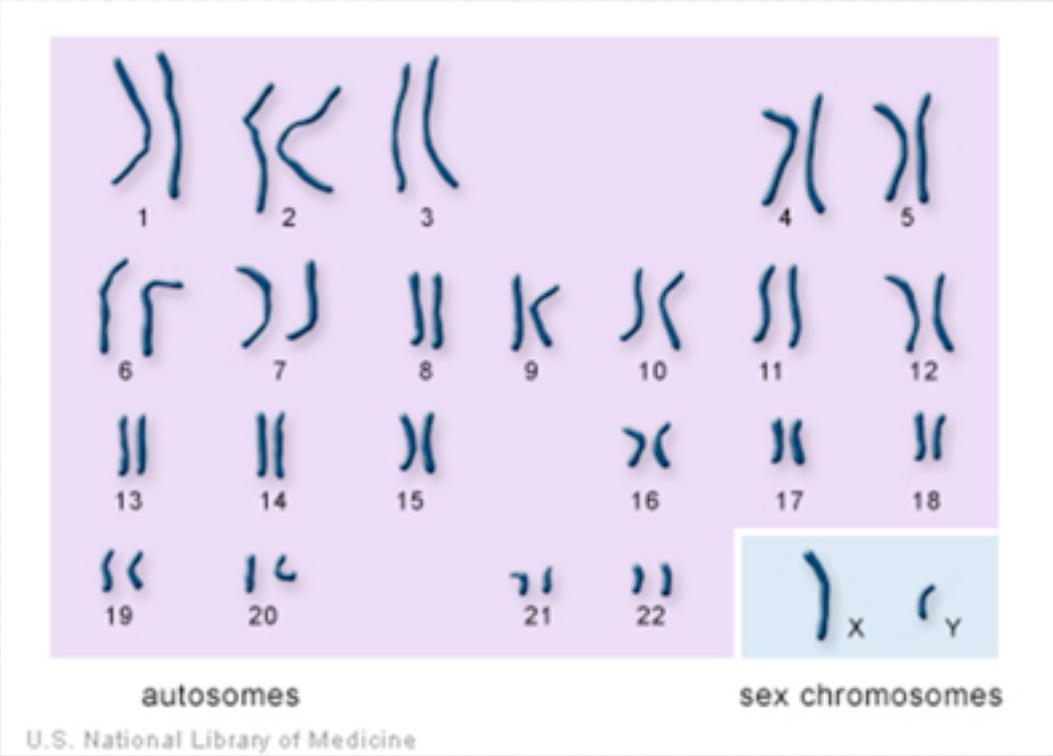
Karyotype



Sex Chromosomes

Humans have 23 pairs of chromosomes.

Karyotype



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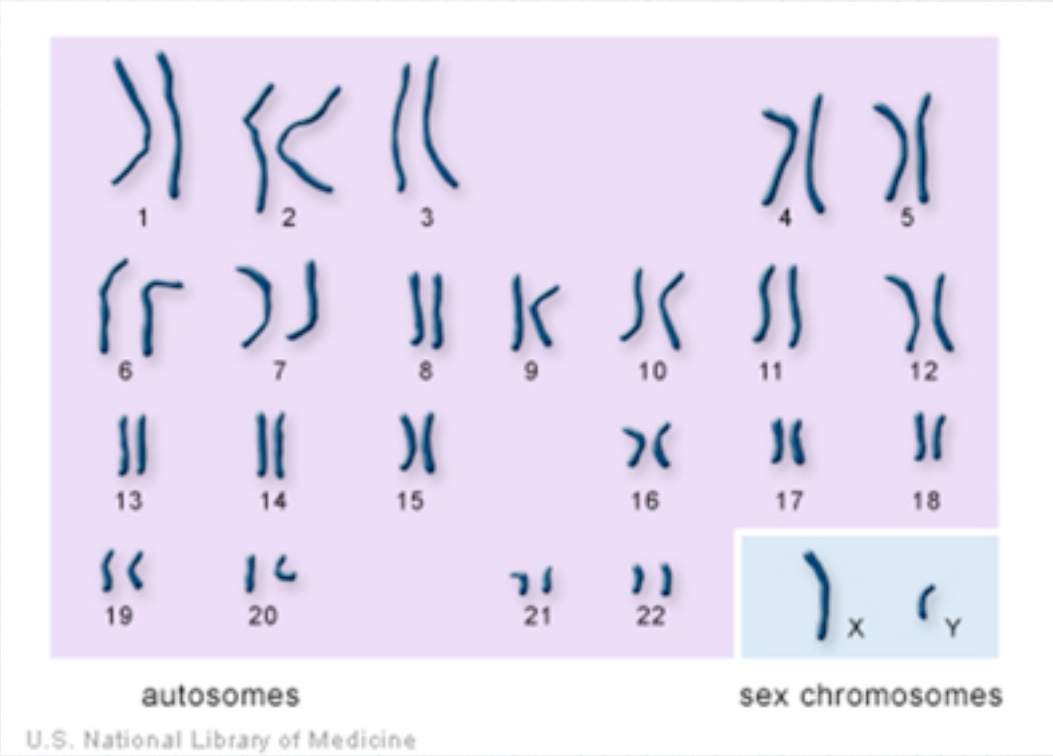

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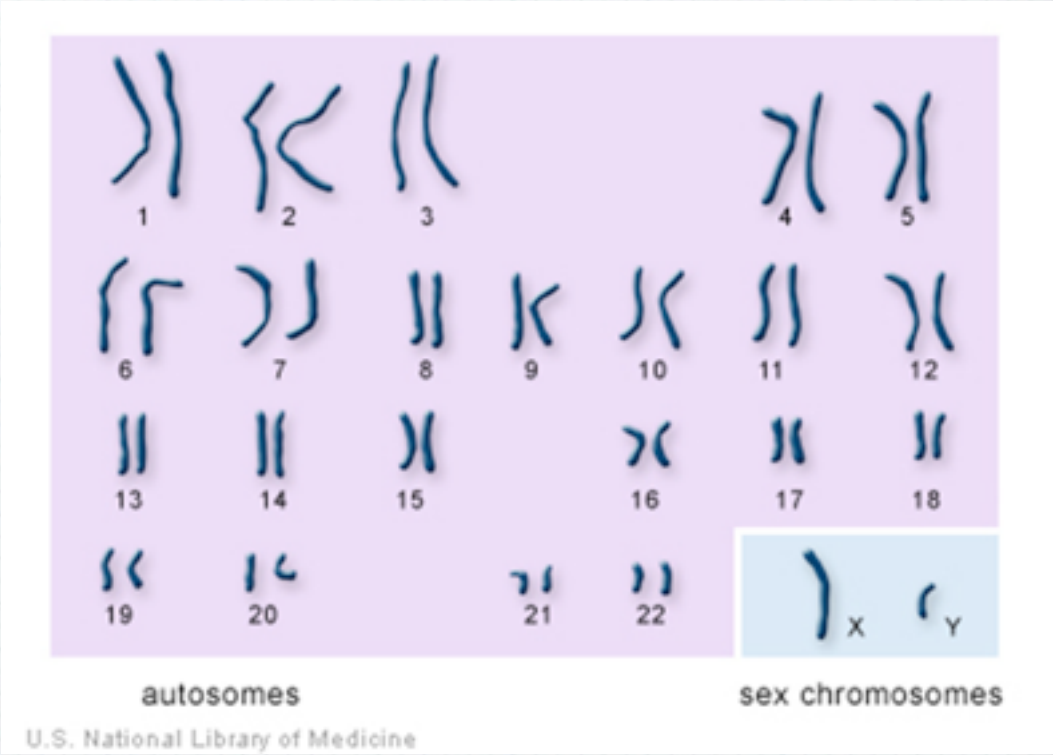
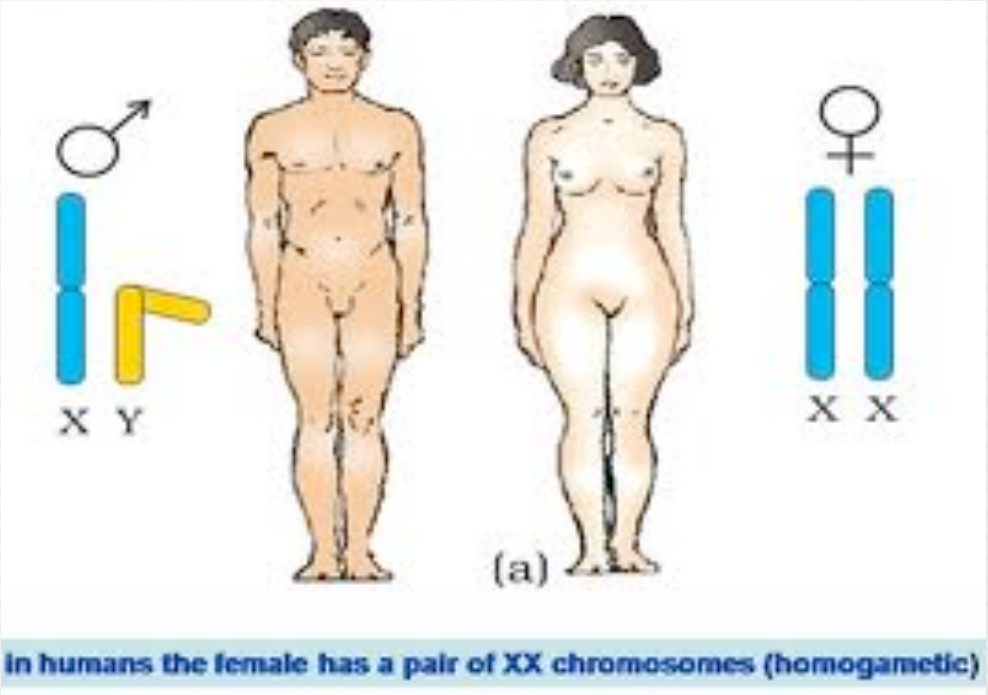
The 23rd pair of chromosomes is related to the sex of an individual , these chromosomes are called sex chromosomes

Karyotype



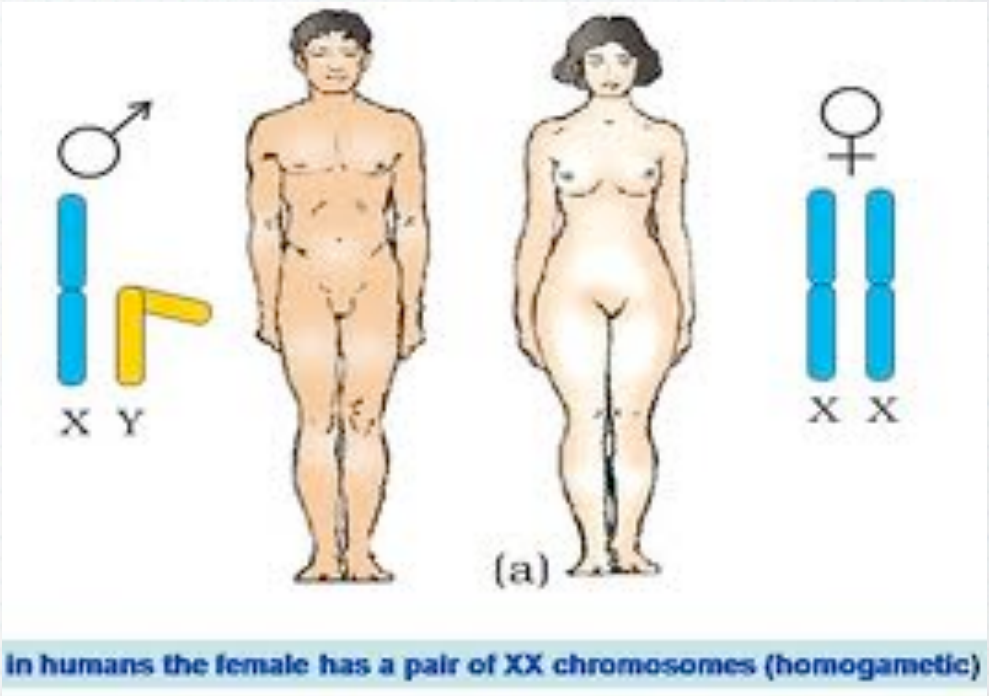
Are you XX or XY?



In humans the female has a pair of XX chromosomes (homogametic)

Are you XX or XY?

* In humans, the sex of an individual depends on the presence or absence of the Y chromosome



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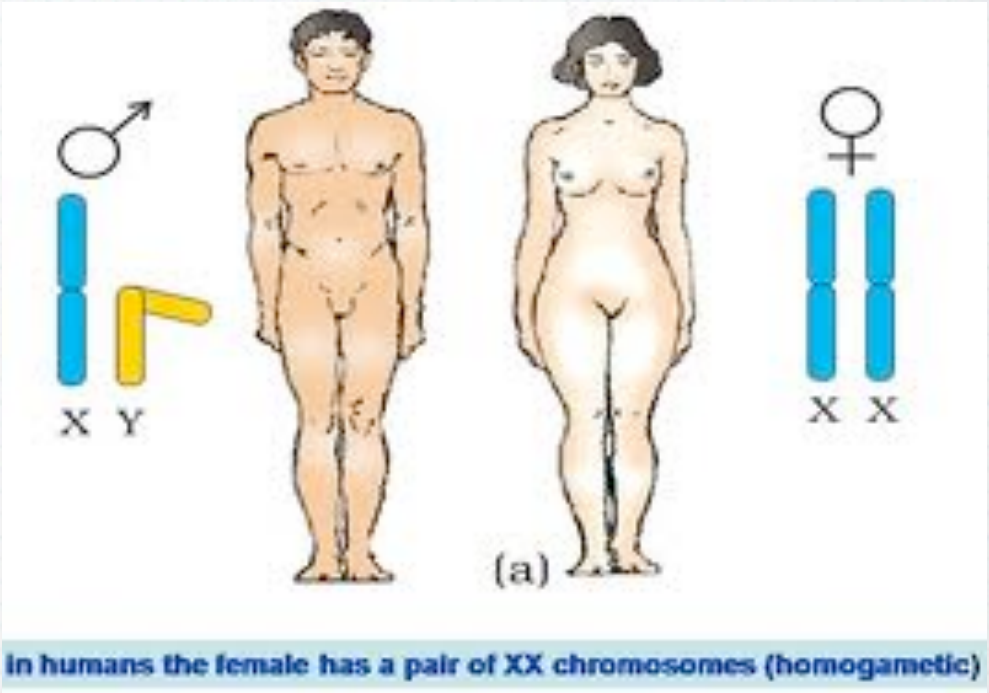

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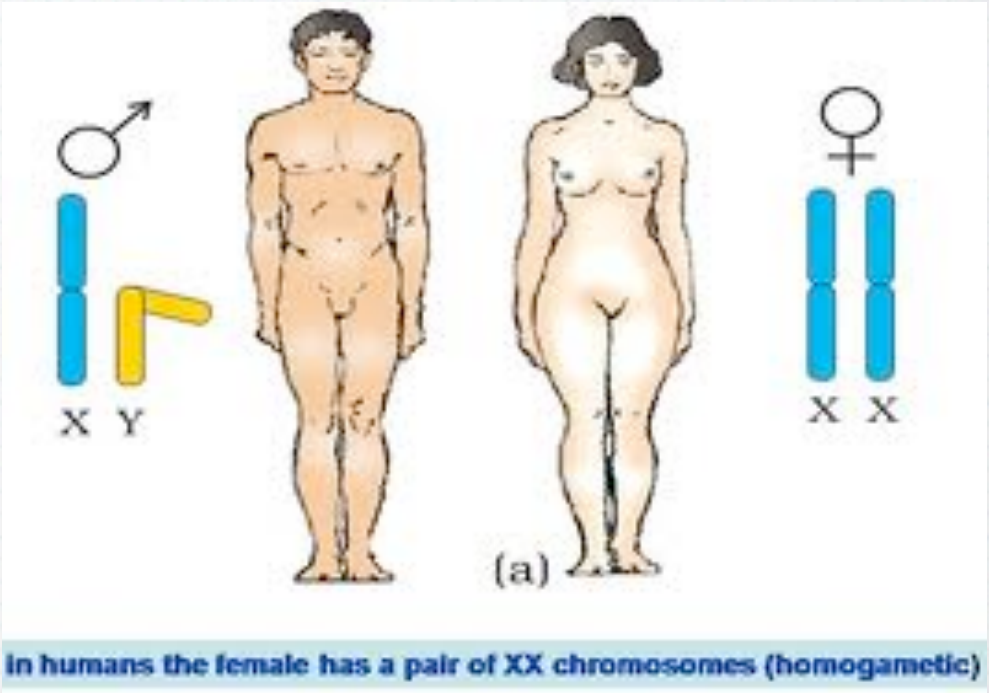

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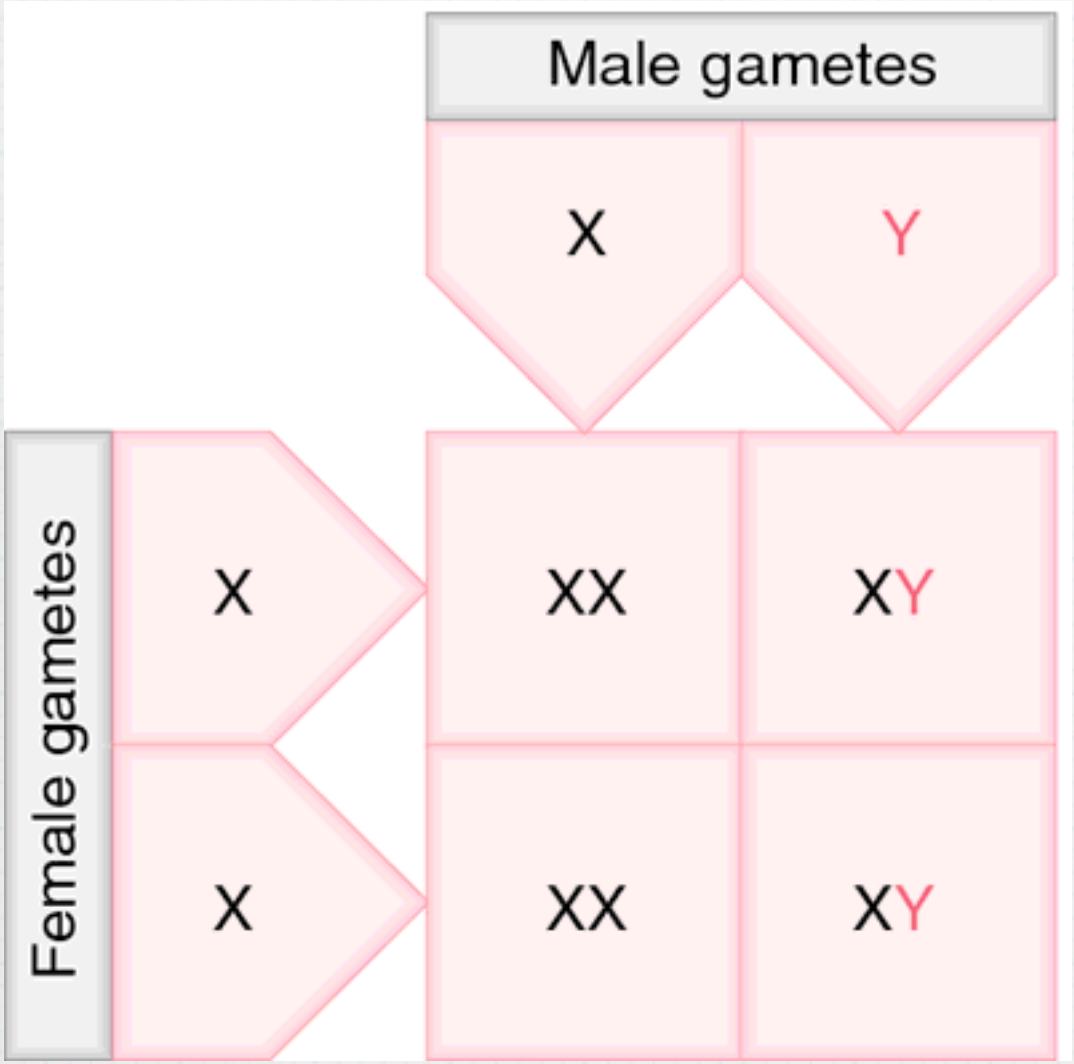
* Y is much smaller and only contains about 25 genes (NOT MANY!)

How sex is determined:



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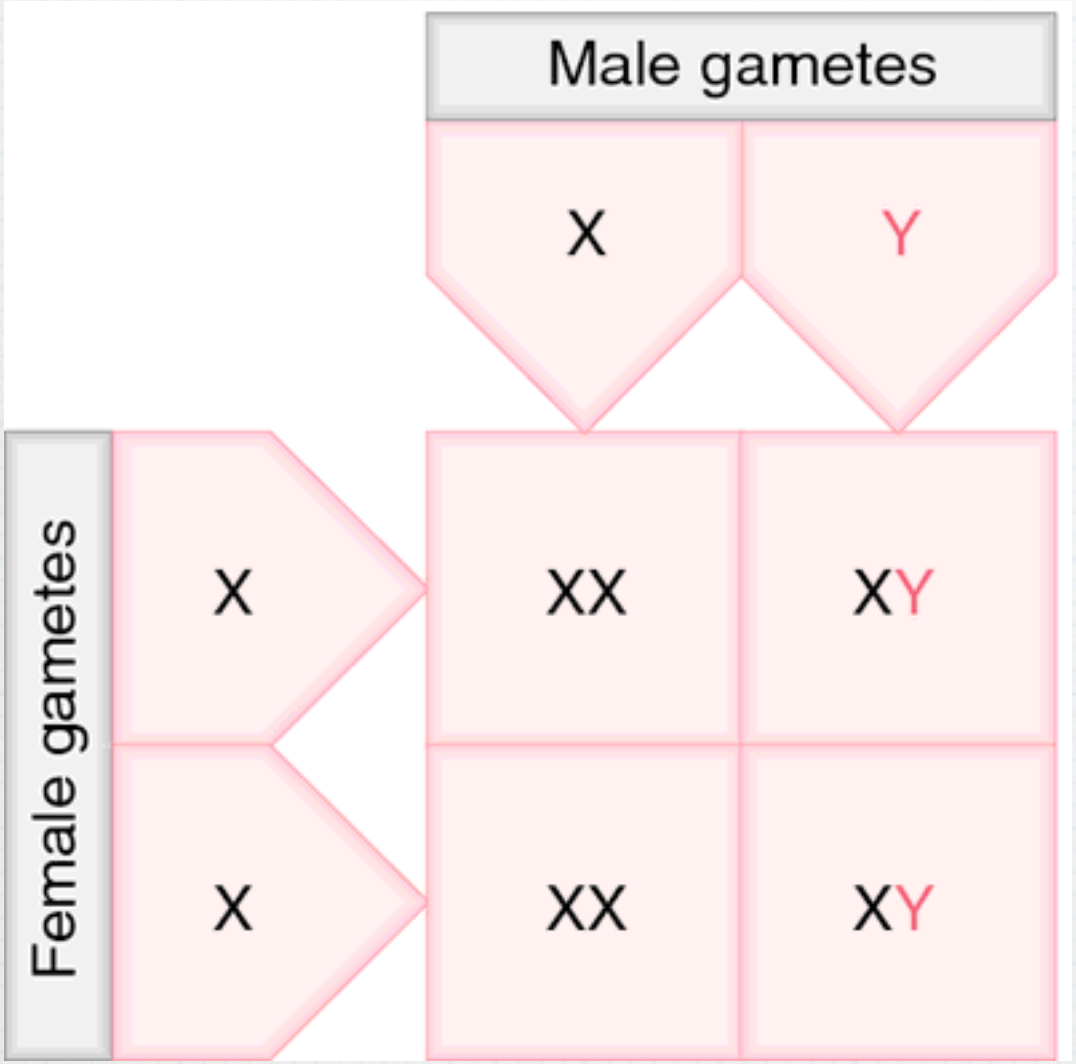

50/50 Chance of becoming a male or female!

Sex-linked Traits

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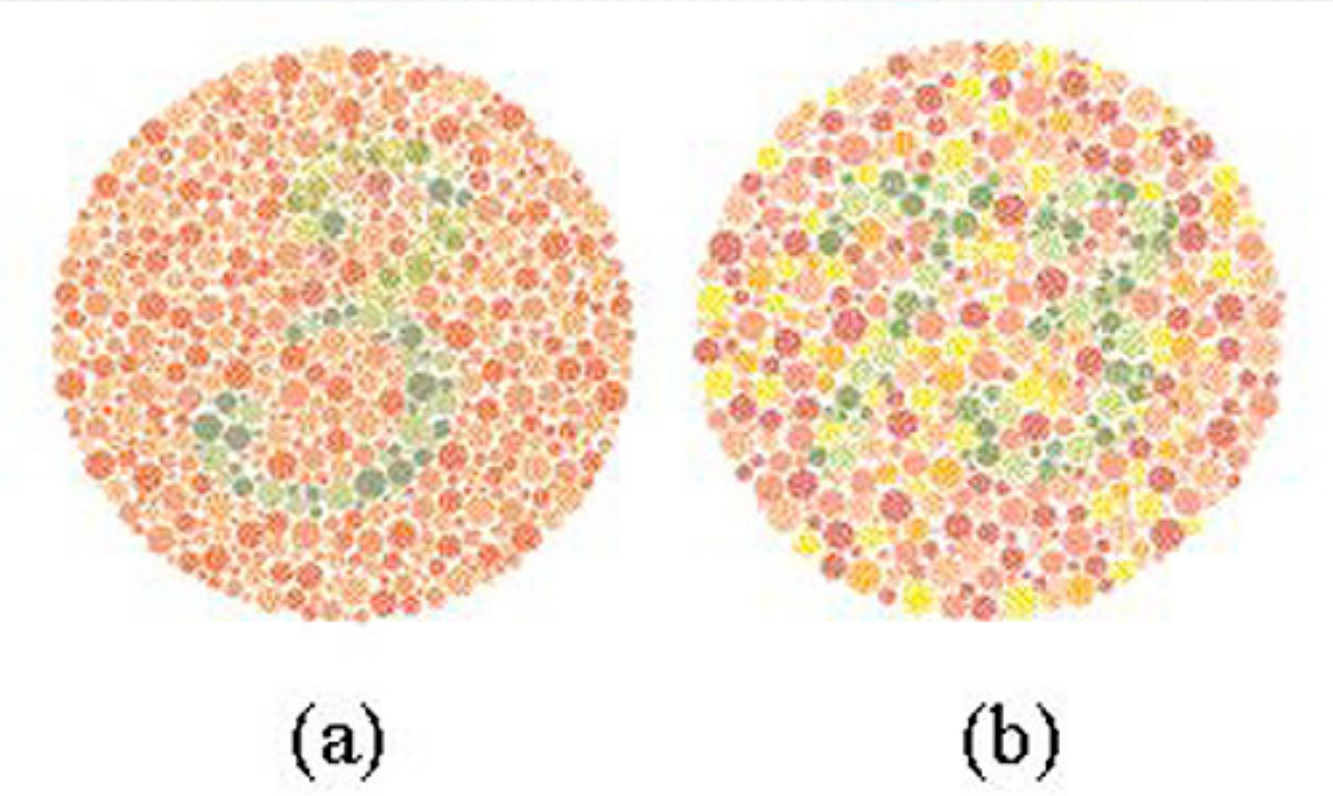
<-Baldness

Hemophilia->

What do you see?



Color Blindness

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- **is a condition in which certain colors cannot be distinguished, and is most commonly due to an inherited condition.**

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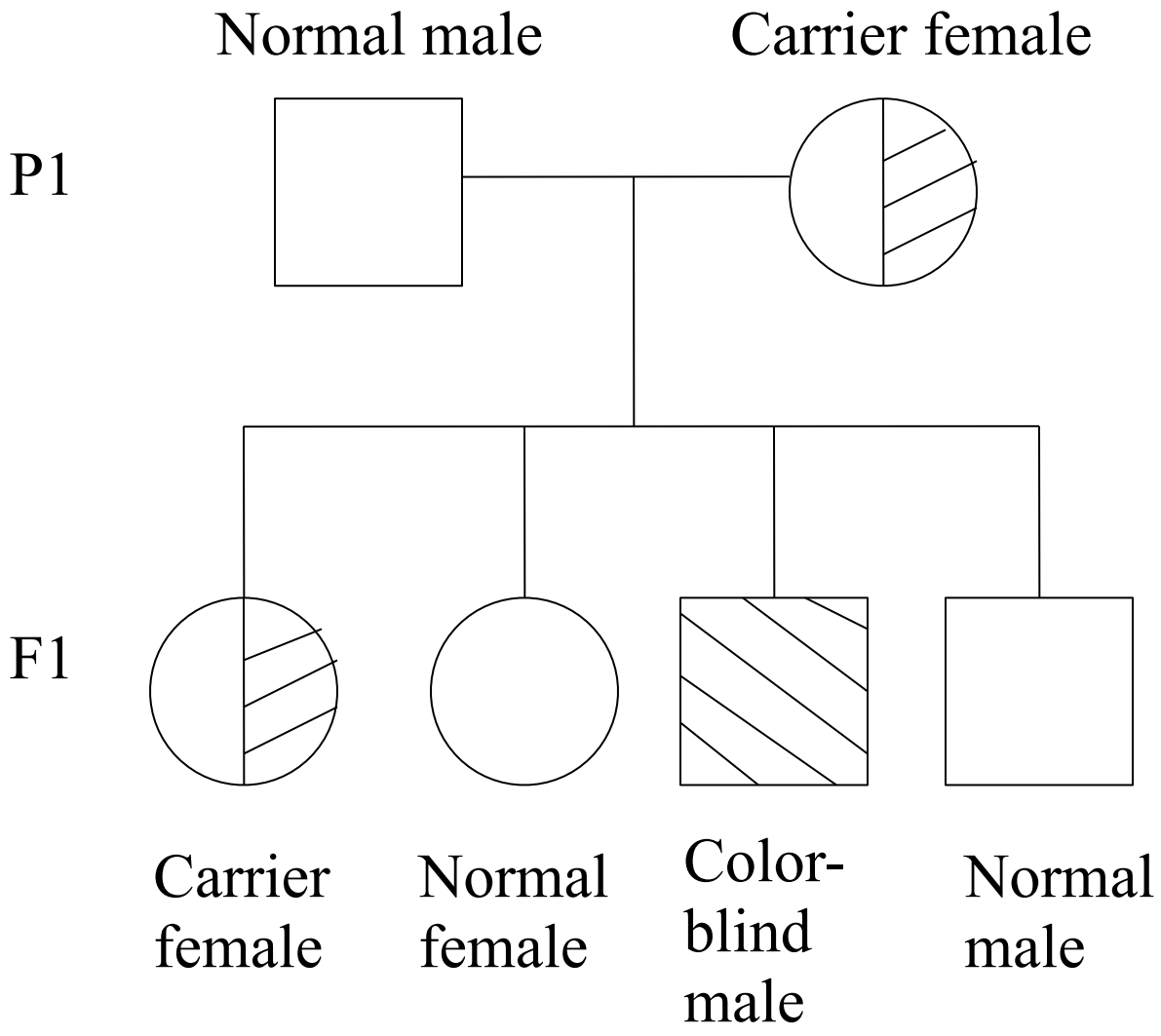
- Problems in distinguishing reds and greens are the most common.

A pedigree for color-blindness



Sex-linked Punnett Square

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* X chromosome is shown with superscript. An upper case for dominant, lower case for recessive.
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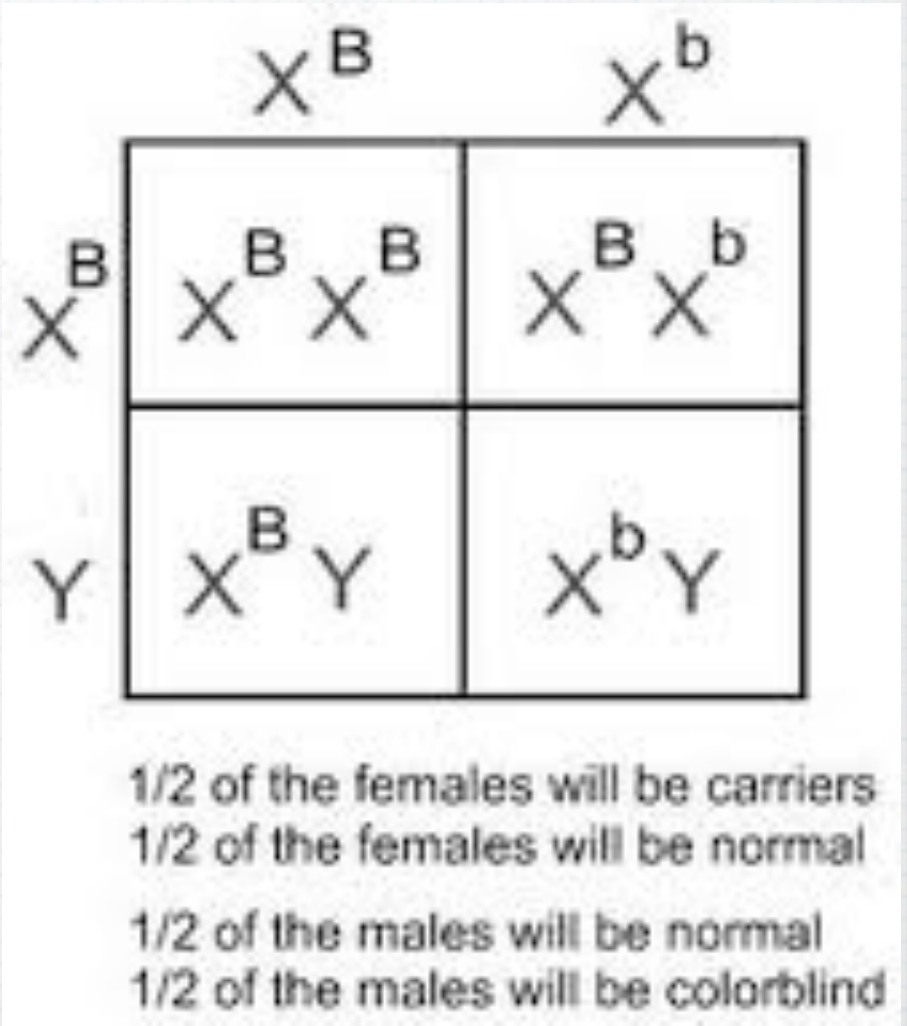


Practice Problem

- A man without colorblindness has children with a woman who is homozygous recessive for colorblindness
  - Give the phenotype and genotype of each parent.
  - Show the cross
  - What can we predict about any girls they will have? What about boys?

HEMOPHILIA

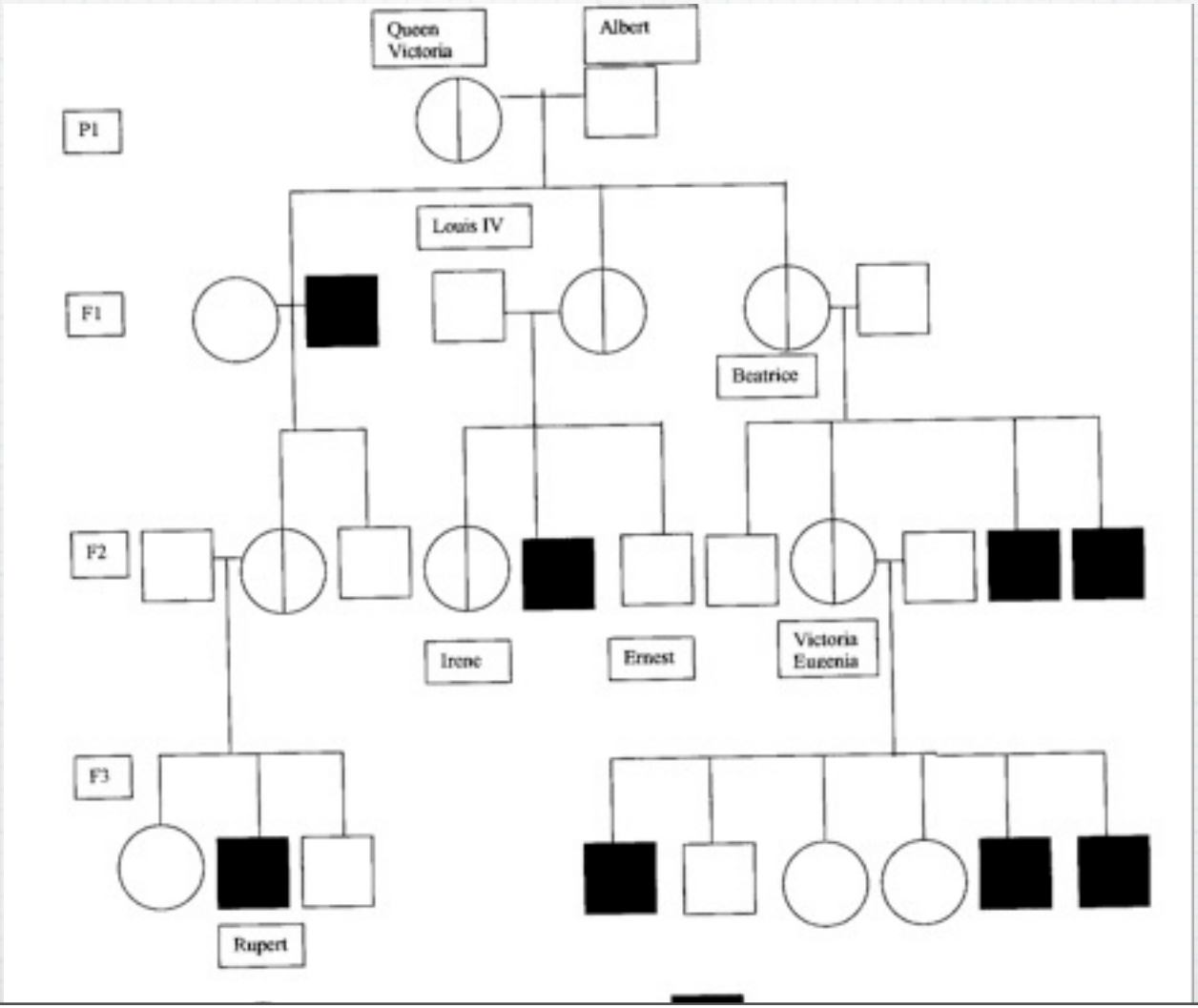
- Hemophilia is often called the disease of kings because it was carried by many members of Europe's royal family.

Queen Victoria

- Queen Victoria of England was a carrier of hemophilia and passed The disease to many of her descendants (including the Russian emperor's family and the Spanish royal family).

Family of Queen Victoria

The history of Queen Victoria's descendants illustrates the hereditary characteristics of hemophilia. We can take a look at her family tree(pedigree).



Explanation of the inheritance of hemophilia

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