

001 Use your knowledge of genetics to develop
002 an explanation for the following:



X



= 100%



X



= 100%



Variations to Mendelian Genetics

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- **Not all genetic traits strictly follow the laws discovered by Gregor Mendel.**
- **Some variations can be observed in all animals including humans.**

- **Four types:**
 - **Incomplete dominance**
 - **Codominance**
 - **Polygenic inheritance**
 - **Sex linked traits and/or Sex Influenced**

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Variation #1: **Incomplete Dominance**

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- A condition when during the heterozygous condition (Bb) the dominant allele **does not** completely overpower the recessive allele , therefore, there is a “BLENDING” of the traits.

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Example: B = black and b = white

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015

BB=

black

bb=

white

Bb=

gray

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Example #1:

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- In rabbits black fur is dominant over white fur. Incomplete dominance is seen. Cross a black fur male with a white fur female

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Black=

White=

BB

bb



Father's Genes

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Example #2:

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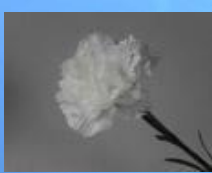
- In carnations, red is dominant over white. Carnations display incomplete dominance. Cross a heterozygous carnations with a homozygous recessive carnation.



Bb



BB



bb

001

002 Variation #2: Codominance

- 003
- 004 • A condition when during the heterozygous
005 condition (Bb) the dominant allele **does not**
006 **completely overpower the recessive allele so both**
007 **traits are seen at the same time.**

008 **Example: B = black and b = white**



010 **BB=**
black

011 **bb=**
white

012 **Bb=**
black and white



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Example 1:

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- In Rhododendrons, pink is dominant over white. This plant displays codominance. Cross a pink rhododendron with a white rhododendron.

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Example 2:

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- In cattle brown is dominant over white. These cattle display codominance. Cross a heterozygous “roan” cattle with another heterozygous “roan” cattle.

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BB

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bb

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Bb

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Variation #3: Polygenic Inheritance

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- **Poly=**
 - many

Examples:

skin tone

hair color

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- **Genic=**
 - Genes

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- Not all traits are controlled by one single set of genes. Polygenic inheritance is when many genes work together and interact to produce one trait that has many phenotypes.

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- Hair color is controlled by three sets of genes all working together to create various hair colors.

- **aabbcc**
Blondest
hair color

AaBbCc
Medium Brown
hair color
(3 dominant/3 recessive)

AABBCC
Blackest
hair color

Skin tone is controlled by four sets of genes all working together to create one shade of skin tone.






















aabbccdd
palest skin
tone

AaBbCcDd
medium skin
tone

AABBCCDD
darkest skin
tone

(4 dominant/4 recessive)

Basic Skin Tones

Tones:	Shading:	Contrasted Shading:
 #FEE1B9	 #FDC786	 #BF9765
 #FBC5A4	 #FBC5A4	 #AA6948
 #FDEEC7	 #FBDE9B	 #C8B17B
 #FCBD84	 #F98C44	 #9A572A
 #A87256	 #6F331D	 #1E0E08
 #9F7C56	 #633C1D	 #190F07
 #B89C84	 #855F44	 #34251B

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AABbCc X AaBBCc

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Example :

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- In snapdragons color of the blossoms displays polygenic inheritance.

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AABB-red

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AABb-peach

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AaBb and AaBB –pink

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Aabb – white

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All other genotypes - yellow

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**Cross a Red snapdragon
with a white snapdragon**

Final variation: Sex Linked Traits/Sex Influenced

- **Sex linked traits** are controlled by a gene located only on the X chromosome
- **Females have two X's: XX**
- **Males have only one X: XY**

- **Females get sex linked diseases less often than males because statistically it is harder to inherit two "bad/lethal genes" than it is to inherit one.**

- **Females must inherit one lethal gene from her father and one from her mother. (XX)**
- **Males can inherit only one lethal gene which comes from his mother. (XY)**

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3 examples of sex linked traits:

- **Red-Green Colorblindness**

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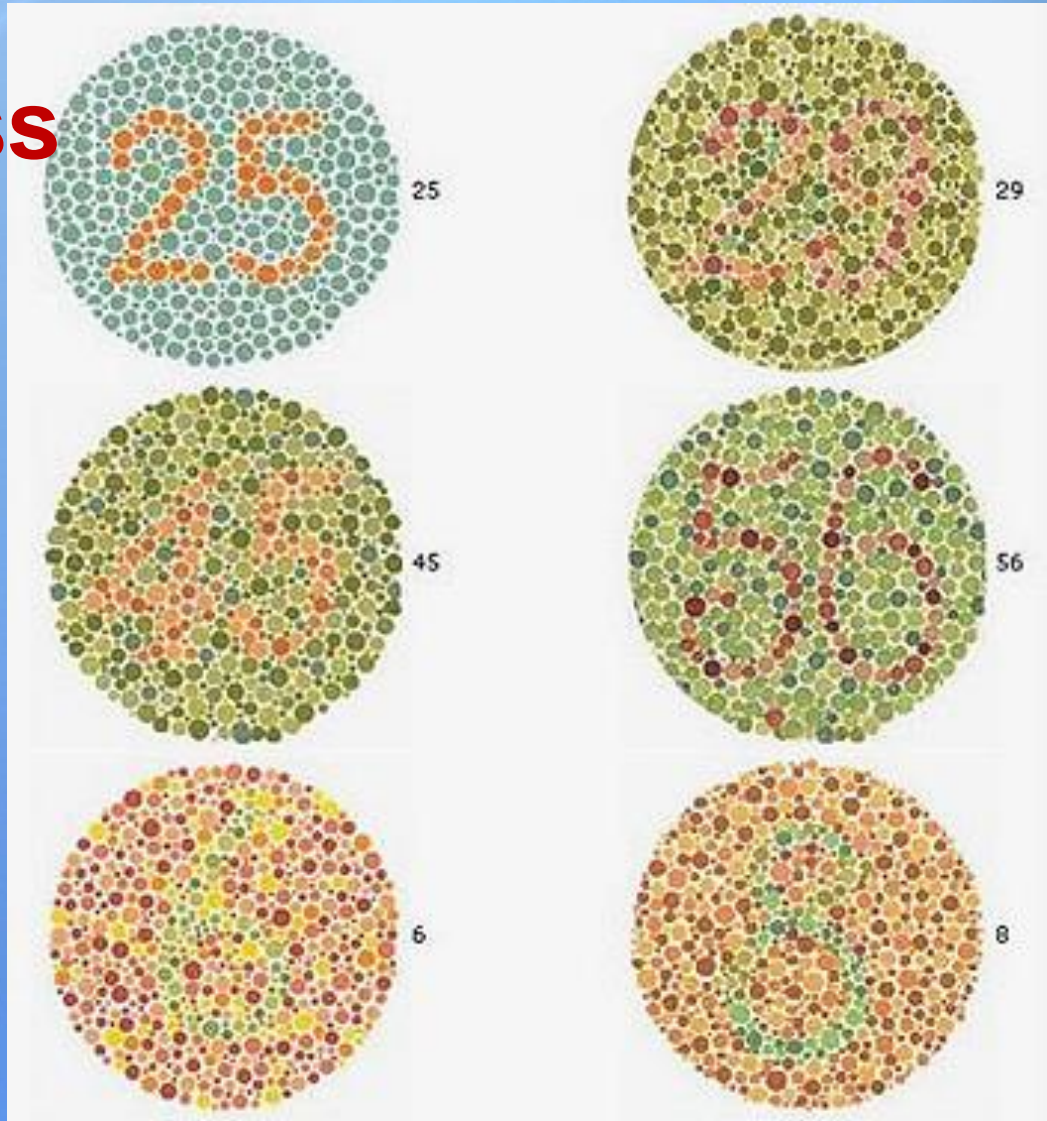
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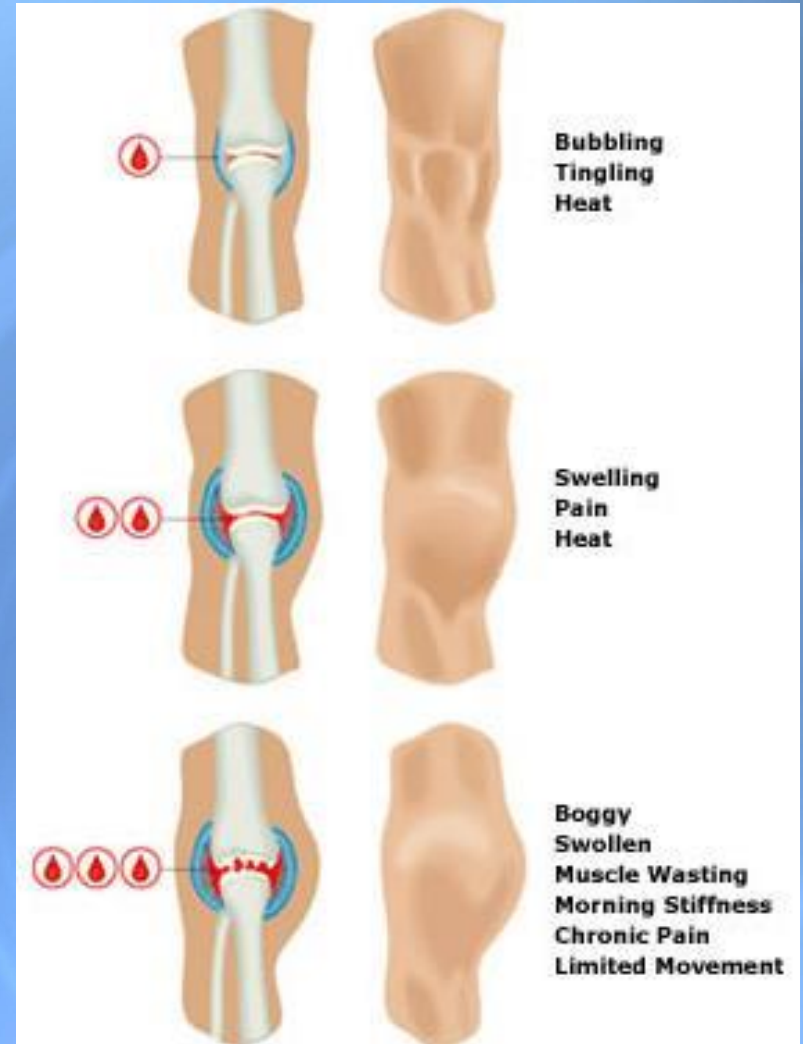
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Hemophilia: Bleeders Disease

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Muscular Dystrophy:

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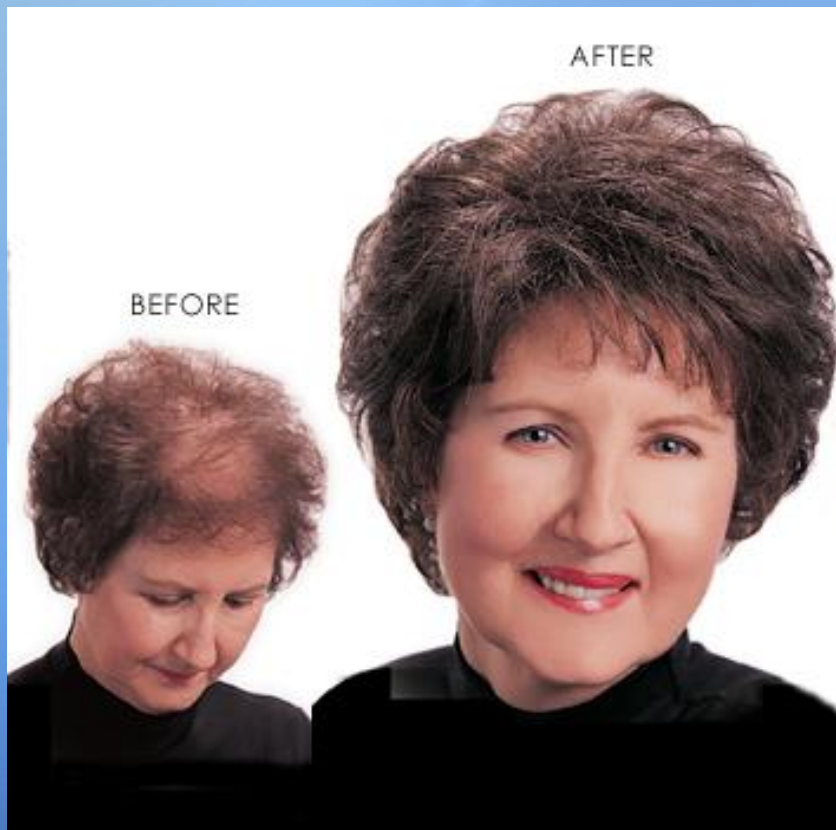
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001 **Sex influenced traits:** These traits are controlled by a
002 gene located on one of the autosome chromosome, chromosome 1-22.

- 003 • **Pattern Baldness:** this autosomal gene is
004 located on chromosome 20. Males must only inherit one
005 recessive gene while a female must inherit two.
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Example #1:

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- In humans the gene for colorblindness (a) is recessive to the gene for normal vision (A). Colorblindness is a sex linked trait. **Cross a colorblind male with a heterozygous/carrier female.**

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Example #2:

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- In humans the gene for hemophilia is recessive (h) to the gene for normal blood type(H). Hemophilia is a sex linked trait.
- **Cross a hemophilic male with a female with normal blood whose father has hemophilia.**

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X_hY x X^HX^h

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New terms you must know:

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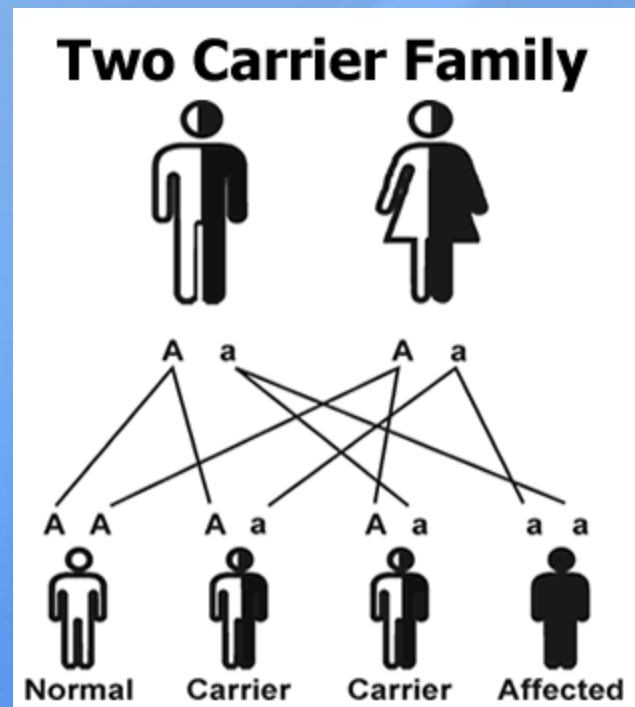
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- **Carrier:** a person who is normal but they carrier the gene for a genetic disease and may pass that gene on to their child.



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Lethal gene:

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- A lethal gene is a gene which causes a genetic disorder. It may or may not be deadly.

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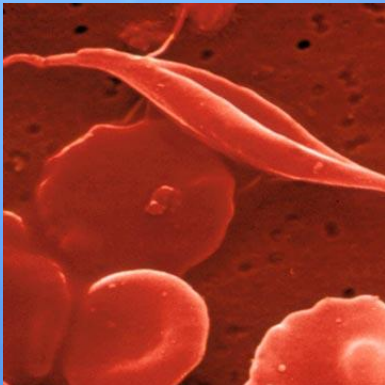
– Example:

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- **Deadly lethal gene: sickle cell anemia**
- **Nondeadly lethal gene: pattern baldness**

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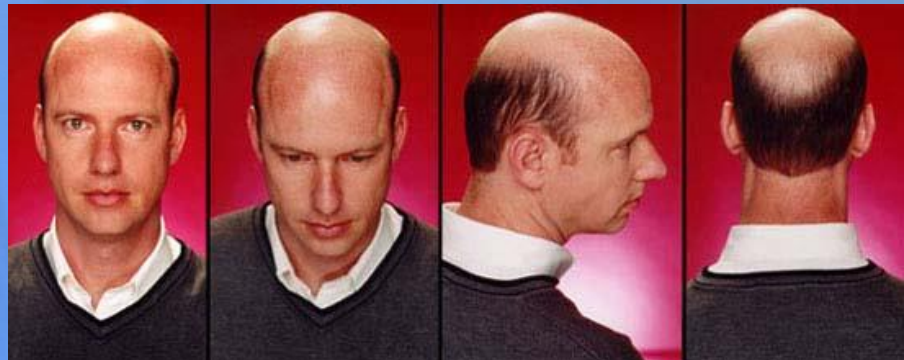


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Pedigree Charts:

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