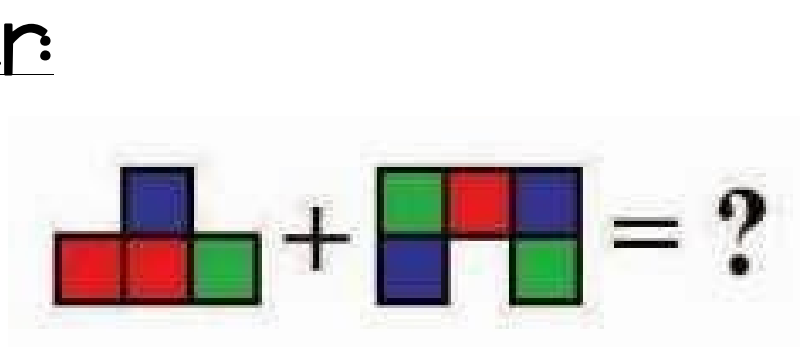
Tuesday February 28th!

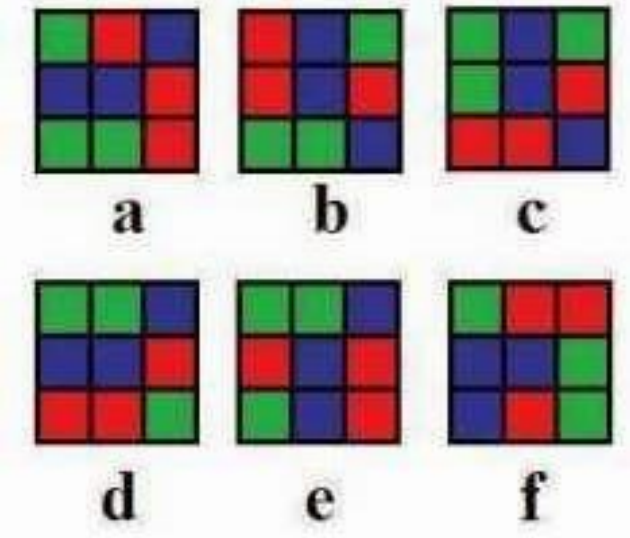
Unit 5 Test on Thurs Feb 9/Fri Feb 10

Quiz TODAY!

Due: Blue People of Troublesome Creek Pedigree!

Starter:





5.4 Complex Patterns of Heredity

Today's Objectives:

- I can describe outcome of polygenic traits
- Given a genotype or phenotype, demonstrate all possible offspring results of complex inheritance patterns:
  - Multiple Alleles (more than just two)
  - Incomplete Dominance
  - Codominance
  - Sex-Linked Traits

5.4 Complex Patterns of Heredity

Simple Patterns of Inheritance

Simple Inheritance = one dominant allele, one recessive allele

Examples: Purple vs. white pea flowers

Yellow vs. green pea seeds

In humans: dimples, freckles, earlobes...blue skin color!

Most human inheritance patterns do NOT follow simple Mendelian inheritance! (Eye color, skin color, hair color, etc.)

5.4 Complex Patterns of Heredity

How do we get these phenotypes?

5.4 Polygenic Inheritance

Polygenic Traits:

Poly = many Genic = genes/segments of DNA

- Polygenic traits:

  Controlled by 2 or more segments of DNA

- Example in Humans: Skin color

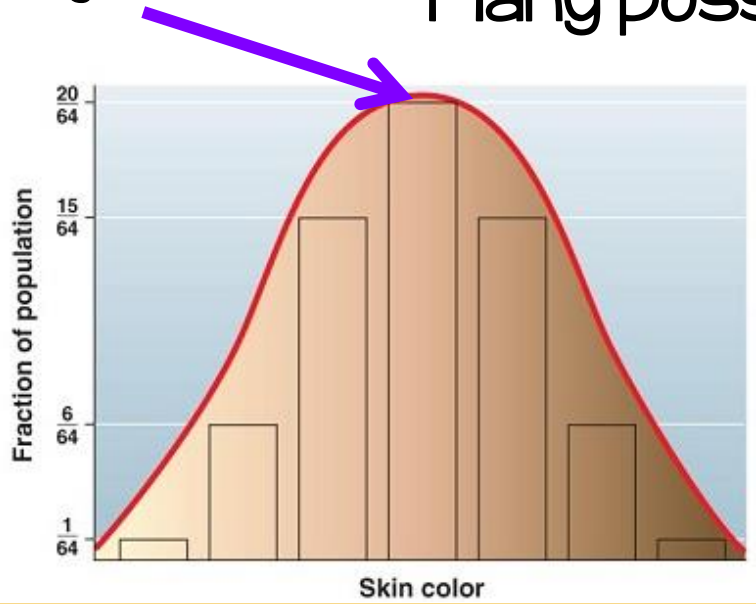
5.4 Polygenic Inheritance

Example in Human: Skin Color

Human skin color is controlled by three genes (segements of DNA)
i.e. AaBbCc

Average Skin Color

Many possible phenotypes!



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ABC	AABBCC	AABBCc	AABbCC	AABbCc	AaBBCC	AaBBCc	AaBbCC	AaBbCc
ABc	AABBCc	AABBcc	AABbCc	AABbcc	AaBBCc	AaBBcc	AaBbCc	AaBbcc
AbC	AABbCC	AABbCc	AAbbCC	AAbbCc	AaBbCC	AaBbCc	AabbCC	AabbCc
Abc	AABbCc	AABbcc	AAbbCc	AAbbcc	AaBbCc	AaBbcc	AabbCc	Aabbcc
aBC	AaBBCC	AaBBCc	AaBbCC	AaBbCc	aaBBCC	aaBBCc	aaBbCC	aaBbCc
aBc	AaBBCc	AaBBcc	AaBbCc	AaBbcc	aaBBCc	aaBBcc	aaBbCc	aaBbcc
abC	AaBbCC	AaBbCc	AabbCC	AabbCc	aaBbCC	aaBbCc	aabbCC	aabbCc
abc	AaBbCc	AaBbcc	AabbCc	Aabbcc	aaBbCc	aaBbcc	aabbCc	aabbcc

1 : 6 : 15 : 20 : 15 : 6 : 1

5.4 Polygenic Inheritance

Example in Human: Skin Color

Gene A	aa	Aa	Aa	Aa	AA	Aa	AA
Gene B	bb	bb	bb	BB	Bb	BB	BB
Gene C	cc	cc	Cc	cc	Cc	CC	CC
Phenotype	 Very Light			 Medium			 Very Dark
# of "light"/recessive alleles	6	5	4	3	2	1	0
# of "dark"/dominant alleles	0	1	2	3	4	5	6

5.4 Multiple Alleles

Multiple Alleles

- More than two alleles possible for a genotype

Example:

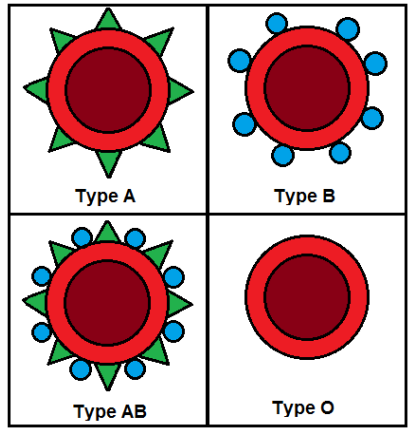
Pea flower color = only 2 alleles

F (purple) OR f (white)

VERSUS

Human blood type = THREE alleles

Type A, Type B, Type O



Note!
More than two alleles might be possible, but an individual will only have two alleles in DNA

Multiple Alleles

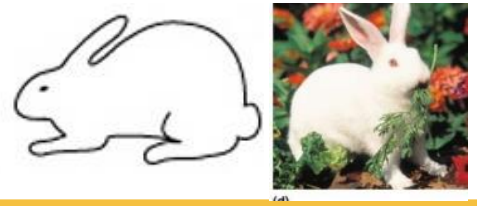
Solving Problems with Multiple Alleles

In some rabbit breeds, fur has multiple alleles

Wild-type 

Chinchilla 

Himalayan 

Albino 

Allele	Phenotypes
C	Wild type; the most dominant fur pattern
C^{ch}	Chinchilla; recessive only to wild type
C^{h}	Himalayan; dominant over albino only
C	Albino; recessive

5.4 Multiple Alleles

Solve this...

Allele	Phenotypes
C	Wild type; the most dominant fur pattern
C^{ch}	Chinchilla; recessive only to wild type
C^{h}	Himalayan; dominant over albino only
c	Albino; recessive

$C^{h}c$ ✖ $C^{ch}C^{h}$

	C^{h}	c
C^{ch}	$C^{ch}C^{h}$	$C^{ch}c$
C^{h}	$C^{h}C^{h}$	$C^{h}c$

5.4 Multiple Alleles

Solve this...

Allele	Phenotypes
C	Wild type; the most dominant fur pattern
C^{ch}	Chinchilla; recessive only to wild type
C^{h}	Himalayan; dominant over albino only
c	Albino; recessive

	C^{h}	C
C^{ch}	$C^{ch}C^{h}$	$C^{ch}C$
C^{h}	$C^{h}C^{h}$	$C^{h}C$

Possible Phenotypes

Chinchilla Fraction: _____ %: _____

Chinchilla Fraction: _____ %: _____

Himalayan Fraction: _____ %: _____

Himalayan Fraction: _____ %: _____

5.4 Complex Patterns of Heredity

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  - Codominance
  - Sex-Linked Traits

Wednesday March 1st

Unit 5 Test on Thurs Feb 9/Fri Feb 10

5.4 Quiz on Tuesday March 7

Starter:

Based on your notes about rabbit fur...

Cross a homozygous albino rabbit with a Cc^{ch} wild-type rabbit

Give the phenotypic ratio for all possible phenotypes in rabbits.

	C	c^{ch}
c	C c	c^{ch} c
c	C c	c^{ch} c

5.4 Complex Patterns of Heredity

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5.4 Codominance vs. Incomplete Dominance

Reminder...Simple Inheritance:

- One allele is COMPLETELY dominant over another

Now...

Codominance & Incomplete Dominance:

- Both alleles appear to make a new phenotype

5.4 Codominance

Codominance:

- Mix/blotching of both dominant alleles
- NEITHER dominant allele is lost, both show
- Example: Japanese Camellia

PP

Dominant

PW

Codominant

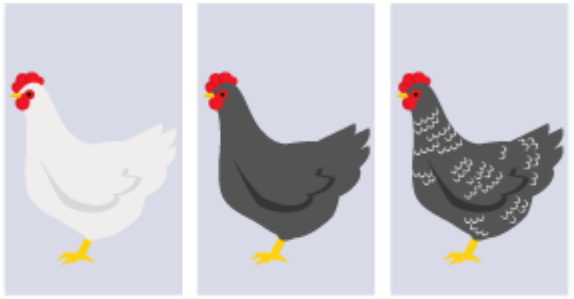
WW

Dominant

5.4 Codominance

Codominant Problems:

Both white (W) and black (B) feather color are dominant in chickens. Speckled (BW) is the codominant phenotype. **Cross a speckled chicken with a black feathered chicken.**



Phenotype	White	Black	Speckled
Genotype	WW	BB	BW

% Black 50%

% White 0%

% Speckled 50%

	B	W
B	BB	BW
B	BB	BW

5.4 Incomplete Dominance

Incomplete Dominance:

- Blending of both dominant alleles
- Neither allele shows up completely
- Example: Snapdragon flowers

C^RC^R

Dominant

C^RC^W

C^WC^W

Dominant

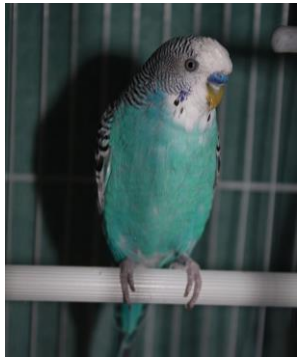
Incompletely Dominant

5.4 Incomplete Dominance

Incomplete Dominance Problems:

Parakeets have MANY different color schemes and patterns of inheritance. The "blue series" of parakeets follows **incomplete dominance.**

Genotype	Phenotype
B^SB^S	Sky blue
B^MB^M	Mauve
B^SB^M	Cobalt



Sky Blue

Cobalt

Mauve

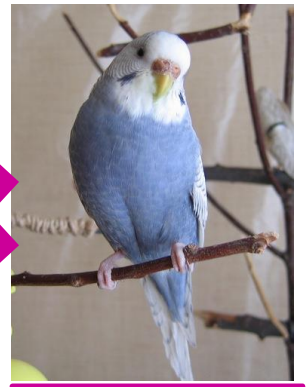
Heterozygous!

5.4 Incomplete Dominance

Incomplete Dominance Problems:

Cross a Cobalt parakeet with a Mauve parakeet. What are the possible phenotypes and % probability for each?

Cobalt



Mauve

	B^S	B^M
B^M	B^SB^M	B^MB^M
B^M	B^SB^M	B^MB^M

Possible Phenotypes:

50% Cobalt

50% Mauve

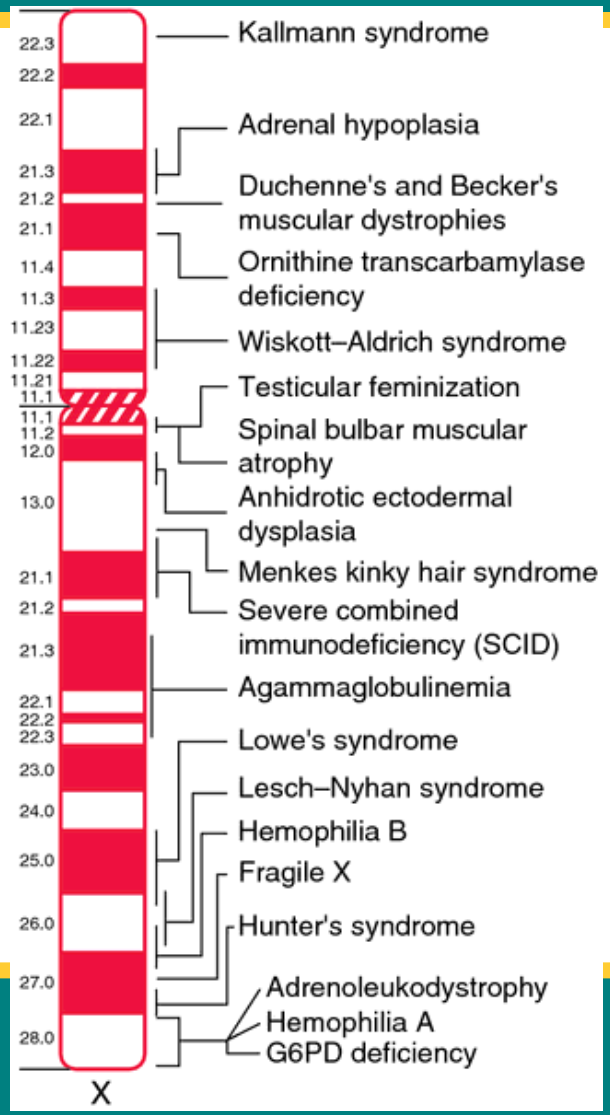
0% Sky Blue

5.4 Sex-Linked Traits

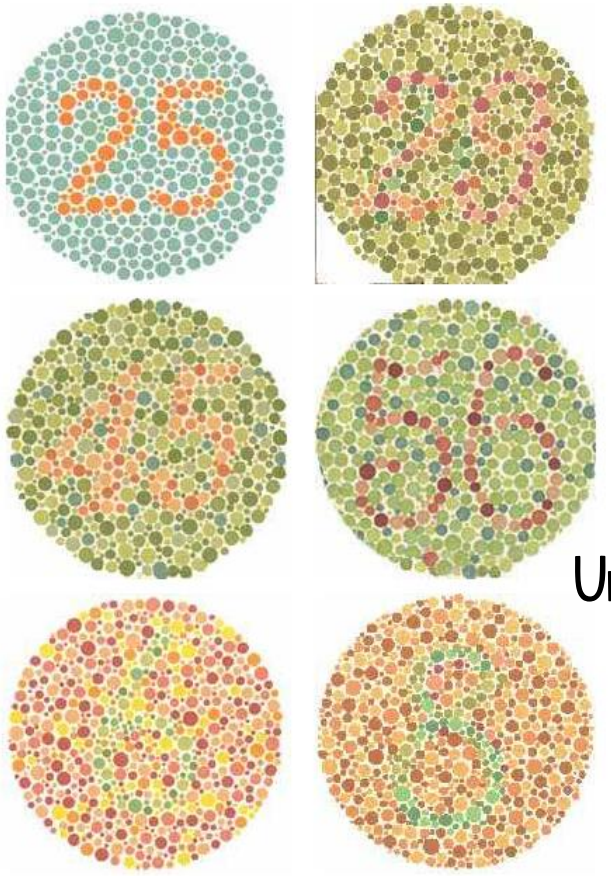
Sex-Linked Traits:

- Alleles of traits found on the X or Y sex chromosomes
- Some genetic disorders found on X chromosome
  - Examples: Colorblindness & Hemophilia

More common in males!



Can you see the numbers?

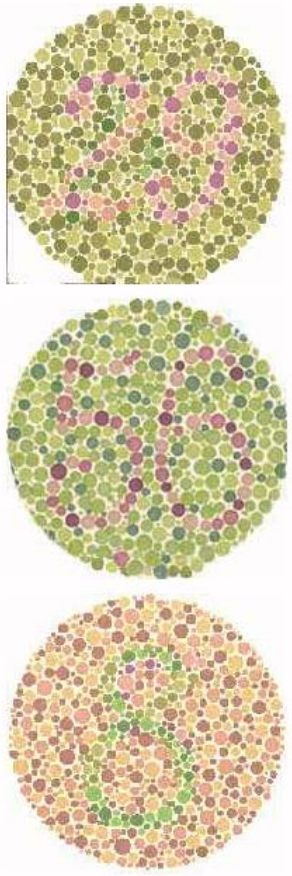


Color Blindness:

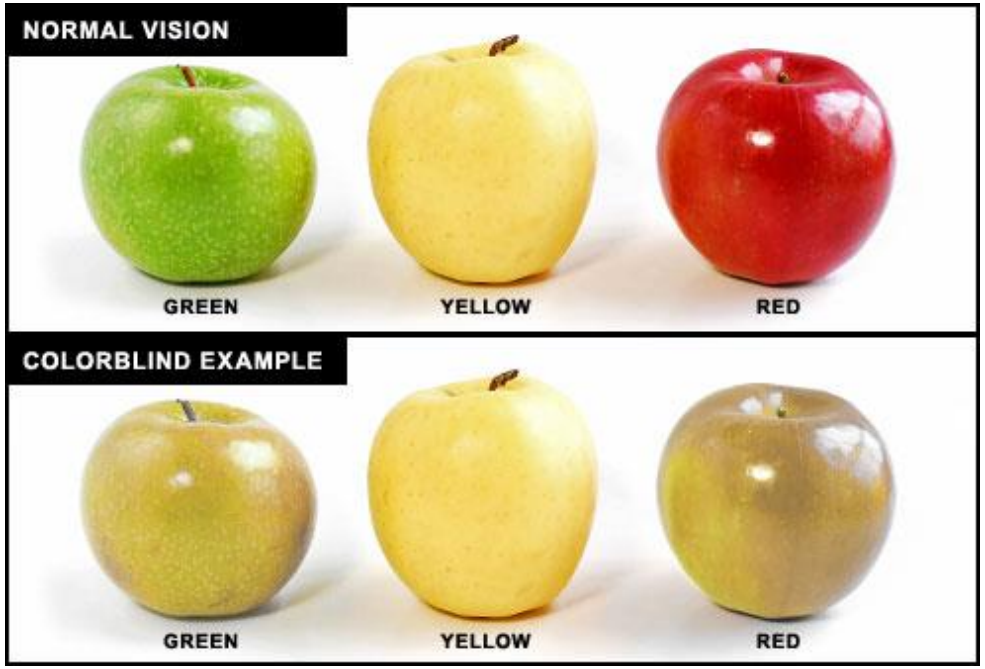
Carrier female → X^c X

Unaffected male → X y

	X^c	X
X	$X^c X$	$X X$
y	$X^c y$	$X y$



5.4 Sex-Linked Traits



5.4 Sex-Linked Traits