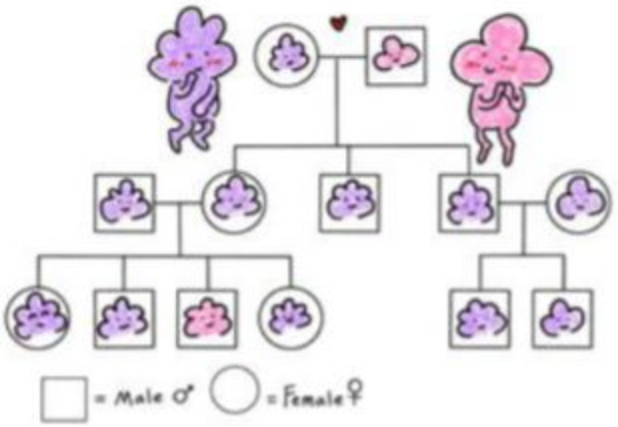
NOTES 5.2

Chapter 5- Genetics
Lesson 2 - Understanding Inheritance



Complex Patterns of Inheritance

Okay, so what about organisms that inherit 1 allele from each parent and appear in phenotype as a mixture of both parents?

Well, for some alleles, inheritance patterns called –

incomplete dominance & **codominance** exist.

Q: What is incomplete dominance?
A: when an offspring's traits appear to be a blend of alleles; when an offspring's phenotype is a blend of the parents' phenotypes

Ex. $P^R P^R$ vs. $P^r P^r$

	P^r	P^r
P^R	$P^R P^r$	$P^R P^r$
P^R	$P^R P^r$	$P^R P^r$

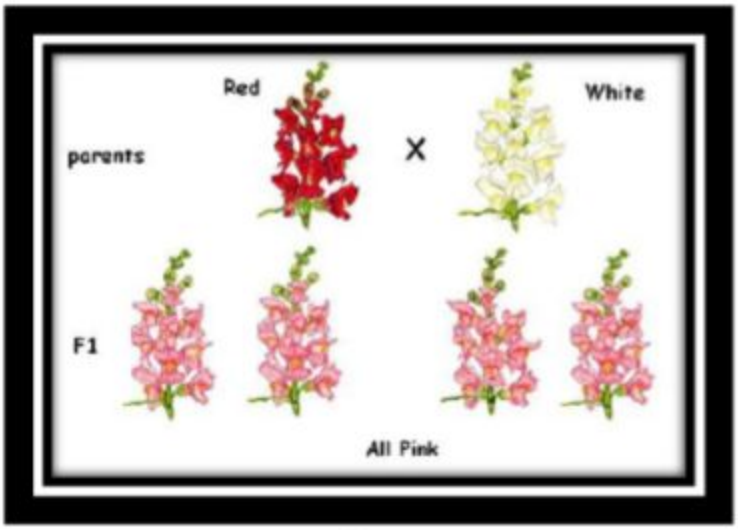


Figure 1. P = petals, ^{R} = red, ^{r} = white

Q: What is codominance?
A: a condition in which neither of 2 alleles of a gene is dominant or recessive but both alleles are represented in the offspring; when both alleles can be observed in a phenotype

Ex. $F^B F^B$ (black) vs. $F^W F^W$ (white)

	F^W	F^W
F^B	$F^B F^W$	$F^B F^W$
F^B	$F^B F^W$	$F^B F^W$

Multiple Alleles

Some human traits are controlled by a single gene that has more than 2 alleles known as –

multiple alleles .

Q: What are multiple alleles?
A: 3 or more forms of a gene that code for a single trait

However, even though a **gene** may have multiple alleles a person can carry only **2** of those alleles. This occurs because **chromosomes** exist in pairs, and each chromosome, in a pair carries only 1 allele for each gene.

Ex. blood type

4 main blood types –

fyi

- **3** alleles control the inheritance of blood types – **A** , **B** , and **O**
- Blood types A and B are **dominant** .
- Blood type O is **recessive** .

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

Q: If a mom is Type B & a dad is Type A, is it possible for them to have a child with Type O blood?

	I^B	i
I^A	I^AI^B	I^Ai
i	I^Bi	ii

Genotypes –
I^AI^B, I^Ai, I^Bi, ii

Phenotypes –
AB, A, B, O

A: YES! 25% chance

Polygenic Inheritance

Some human traits show a large number of phenotypes because the traits are controlled by many genes.

Genes act together as a group to produce a single trait. Ex. height, skin color, etc.

Male or Female?

Q: What factors determine whether a baby is a boy or a girl?
A: the sex of a baby is determined by the genes on its chromosomes

Among our **23** pairs of chromosomes is a single pair called the **sex chromosomes**.

Q: What are the sex chromosomes?
A: the pair of chromosomes that determine whether a person is male or female

Q: What are the chances of parents having a boy or girl?

	X	Y
X	XX	XY
X	XX	XY

Genotypes – 2XX:2XY

Phenotypes – 50% male, 50% female

A: 50% male, 50% female

Q: What sex will the child be if a sperm with a Y chromosome fertilizes an egg?

A: Male, XY

Q: If a dad in the above Punnett Square had an allele ^{A} on his X chromosome, which of his children - his sons or his daughters - would inherit the allele & trait?

A: daughters

Q: Why wouldn't his sons inherit the allele?

A: because boys don't inherit X from dad, only Y

Sex-Linked Genes & Traits

Some human traits are carried on the sex chromosomes – X & Y – known as **sex-linked gene**

Q: What is a sex-linked gene?
A: a gene that is carried on the X or Y chromosome

sex-linked traits

Traits controlled by sex-linked genes are called –

Q: What is sex-linked trait?
A: a trait controlled by a sex-linked gene

fyi

Sex-linked genes –

- can have dominant & recessive alleles (letters)
- are more likely to occur in males than in females
- females are **carriers** of sex-linked traits

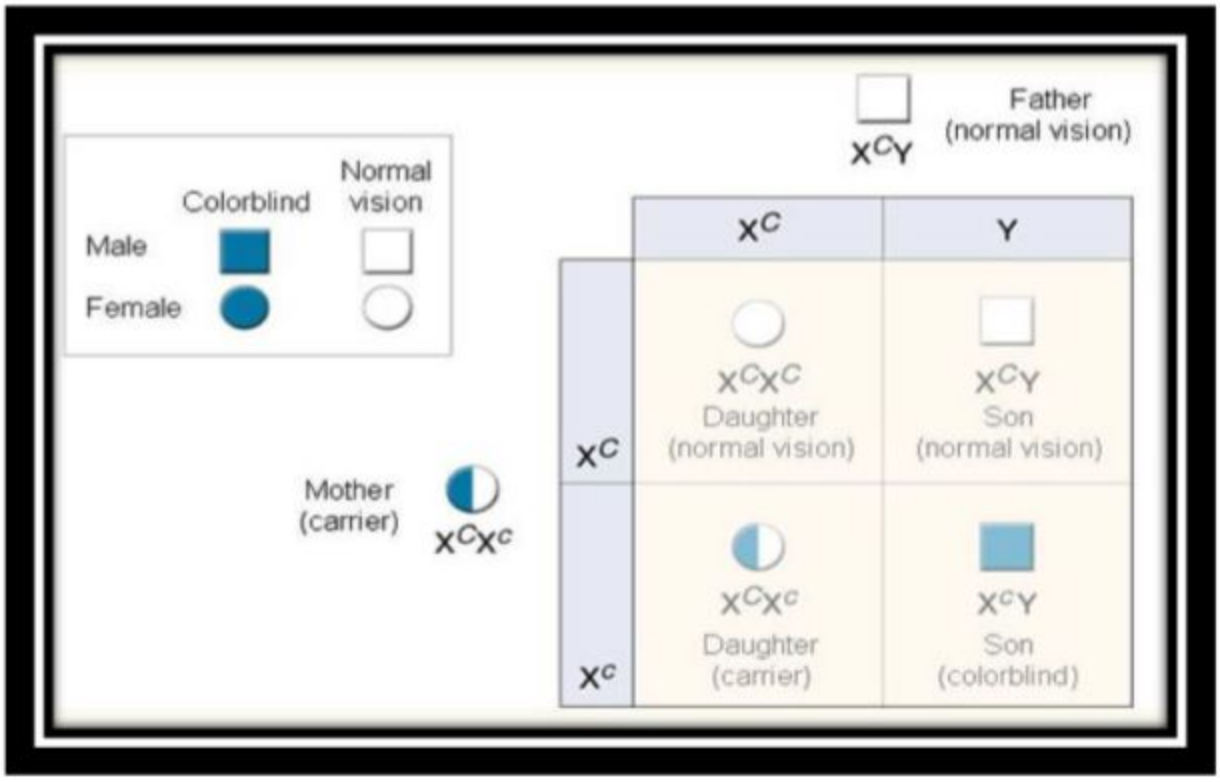
Q: What is a carrier?
A: a person who has one recessive allele for a trait and one dominant allele for a trait

fyi

A carrier-

- DOES NOT have the trait
- passes the recessive allele on to their offspring

Ex. color blindness (red-green)



Q: What allele combination would a daughter need to inherit to be colorblind?

A: X^cX^c

colors as seen with normal vision

same colors as seen with red-green color deficiency

Q: If a sex-linked trait is controlled by a dominant allele, would the trait be more common in males than in females?

A: Males, b/c they only have to inherit 1 allele

Genes & the Environment

The effects of are often altered by the environment – the organism's surroundings.

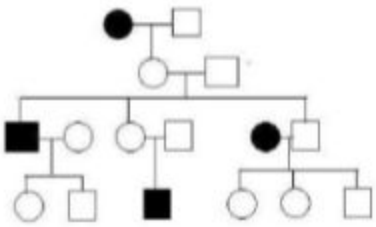
Ex. a person's diet can affect their height by eating foods not rich in necessary protein, vitamins & minerals

Q: How can environmental factors affect a person's height? A: (answer on your CW sheet)

Pedigrees

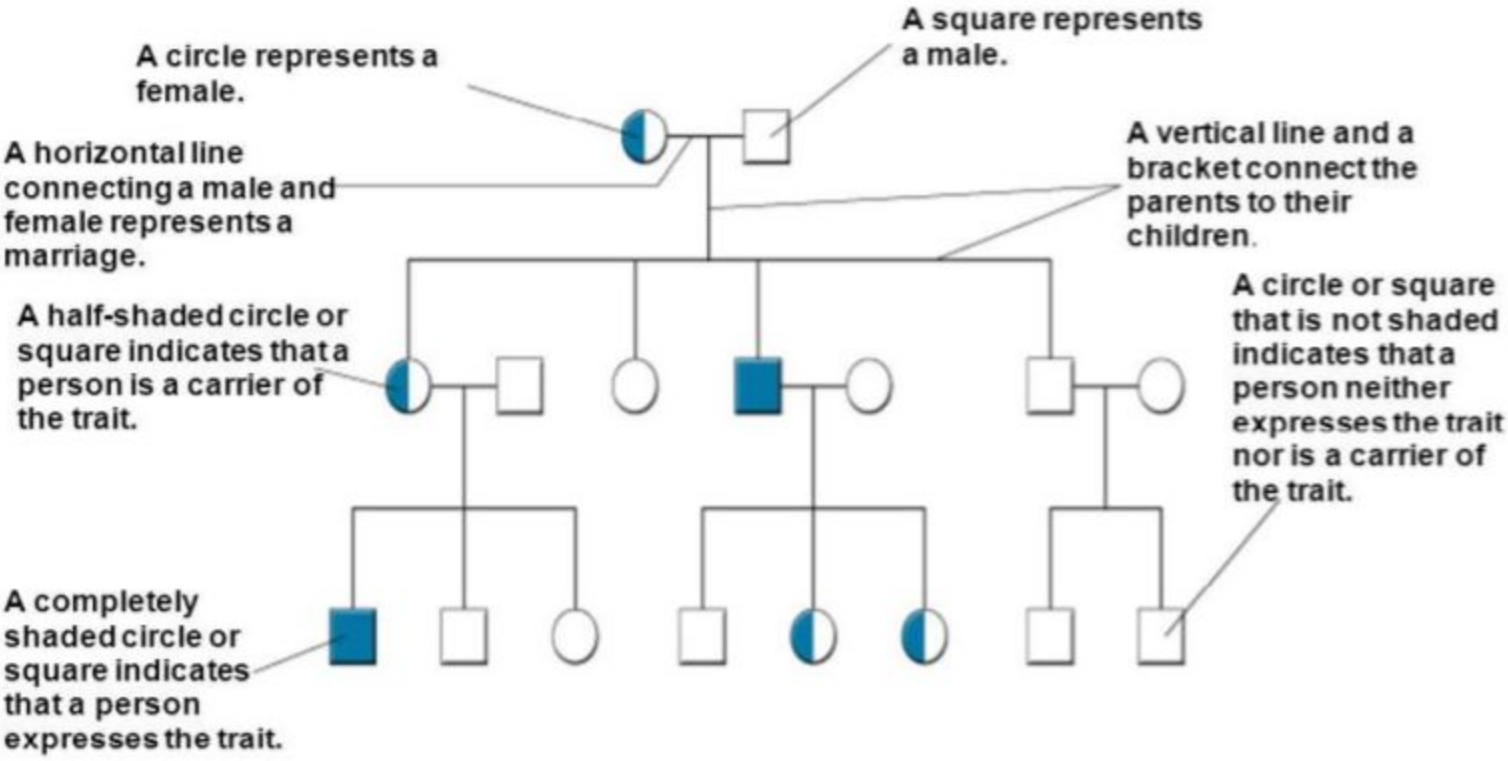
Imagine you are a geneticist interested in studying inheritance patterns in humans. What would you do?

One tool that geneticists use to trace the inheritance of traits in humans is a pedigree.



Q: What is a pedigree?
A: a chart or "family tree" that tracks which members of a family have a particular trait

Exploring a Pedigree



Q: How many married couples are there in the second generation?

A: 3

Q: How many females are carriers?

A: 4

Q: How many 3rd – generation individuals could have colorblind daughters?

A: 3

Q: In all 3 generations, how many males are colorblind?

A: 2

Q: How is a pedigree like a "family tree"? How is it different?

A: Same b/c it shows relatives, different b/c shows traits