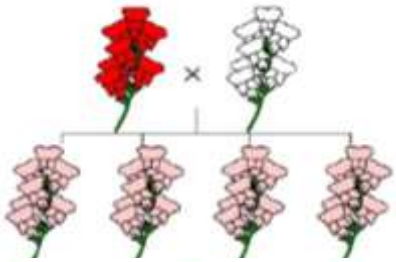
Learning Targets

- Use Punnett squares for unusual monohybrid crosses – incomplete dominance, codominance, blood types, sex-linkage
- Use Punnett square for dihybrid crosses

What is complete dominance?

- In Mendel's classic pea crosses, the F1 offspring always looked like one of the two parental varieties because one allele in a pair showed complete dominance
- Phenotypes of heterozygote and dominant homozygote are indistinguishable



What is incomplete dominance?

- There is no dominant allele or recessive allele
- Example: Red (RR) x White (rr) = Pink (Rr)

What is codominance?

There is no dominant allele or recessive allele, but both are expressed

What is a polygenic trait?

- Two or more genes affect a single phenotype
- Example: Eye color, skin color, height

What does epistasis mean?

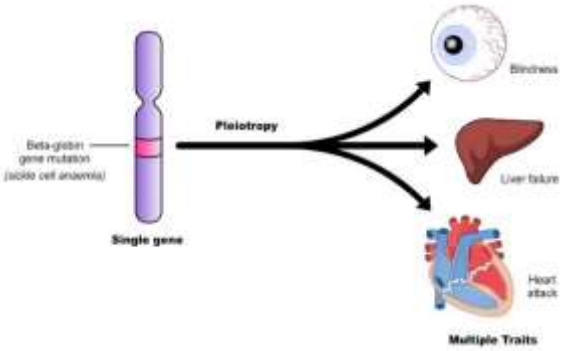
- The phenotypic expression of one gene alters that of another independently inherited gene
- Example: Coat color in Labrador retrievers

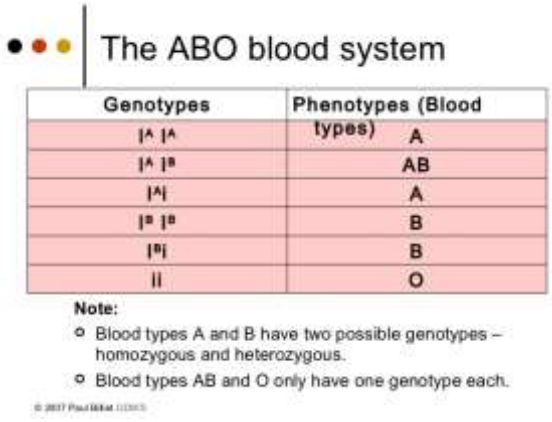
What does multiple alleles mean?

- Two or more alleles affect a single gene
- Example: Blood type (A, B, AB, O)

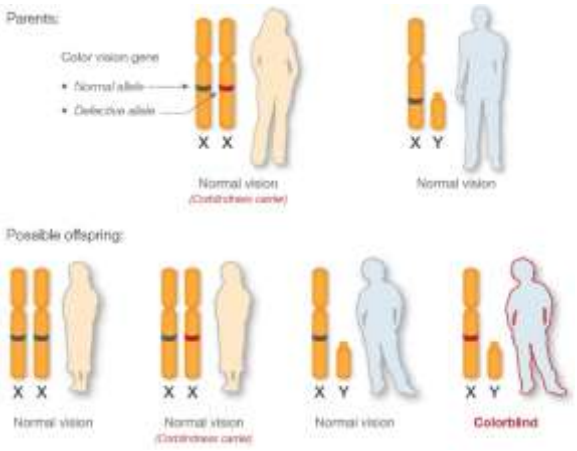
What is pleiotropy?

- A single gene has multiple effects on unrelated traits
- Example: Sickle cell anemia





What is a sex-linked trait?
- A gene is located on either sex chromosome
- Most are found on the X chromosome
- Example: Hemophilia (x-linked) causes blood not to clot, Auricular hypertrichosis (y-linked) which causes excessive hair in the ear

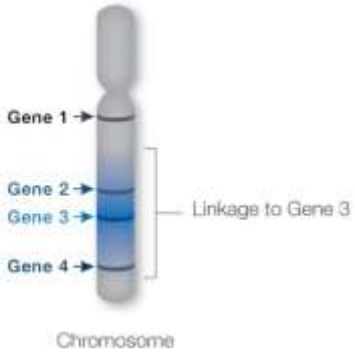


Who was Thomas Morgan?
- Early 1900s, he and his students studied a species of fruit flies, *Drosophila melanogaster*
- Discovered sex-linked traits by choosing the right experimental organism for his research
- "Two years' work wasted. I have been breeding those flies for all that time and I've got nothing out of it."
- Eventually, he and his team discovered a mutant male with white eyes (X^r)

Why fruit flies?
- Fruit flies have only four pairs of chromosomes (three pairs of autosomes, one pair of sex chromosomes)
- Prolific breeders with hundreds of offspring from each mating
- New generation every two weeks

What is a barr body?
- An inactivated X chromosome in each cell of a female mammal
- Example: Tortoiseshell cats have both cells where the X chromosome with orange allele is active and cells where the X chromosome with black allele is active

What is gene mapping?
- Determining the precise position of a gene on a chromosome
- Once the position is known, it can be shown on a diagram



What is gene linkage?
The tendency of DNA sequences that are close together on a chromosome to be inherited together during meiosis

PRACTICE PROBLEM #1
If brown hair and white hair horse alleles show incomplete dominance, what offspring ratios will you see if you cross a brown horse with a white horse?

PRACTICE PROBLEM #2
If red and white flower alleles show codominance, what offspring ratios will you see if you cross a red flower with a white flower?

PRACTICE PROBLEM #3
If a father with blood type A (I^Ai) and mother with blood type B (I^Bi) have a child together, what offspring ratios will you see?

PRACTICE PROBLEM #6
If you have a grey bodied, striped fish (GgRr) breed with a yellow bodied, unstriped fish (ggrr), how would you write that on a dihybrid cross and what would the phenotype ratios be?