

BIO 184 - PAL Problem Set Lecture 9 (Brooker Chapter 4)
Sex-Linkage and Pedigrees

Section A. Sex Determination

Explain what it means when the sex of a particular organism is determined by the chromosomes they inherit from their parents?

Define the terms homogametic and heterogametic with respect to sex determination.

Explain the difference between chromosomal sex determination in mammals (e.g. humans) versus avian species (e.g. chicken). Be sure to include the terms homogametic and heterogametic in your explanation.

What **other** sex determination systems are possible that are not dependent on the specific types of chromosomes they receive from their parents like in humans.

Section B. Sex linked traits

Explain what it means when a trait is considered sex linked.

What does the term hemizygous mean with respect to sex linkage? Compare this to homozygous and heterozygous.

If you were to do a cross for a particular recessive trait such as red-green color blindness, why would you suspect that it is X linked?

What is a reciprocal cross and how is it used to show that a trait is sex linked?

How would set up a reciprocal cross to show that red-green color blindness exhibits an X-linked recessive transmission pattern in humans? Show what the outcomes would be for the reciprocal crosses using the Punnett square method.

If a father has red-green color blindness and the mother is a carrier for this trait, then what are the possible outcomes for their children? Perform a Punnett square to solve this and describe the results.

If a trait is found on the sex chromosomes, but it follows a pseudoautosomal inheritance pattern, then what does this mean as to how you go about handling this type of transmittance? How does that differ from traditional sex linked traits?

Section C. Pedigree analysis

What types of transmission patterns would you be looking for when you are trying to determine whether a trait is recessive versus dominant when inherited?

If a trait is X-linked recessive in humans, then what types of transmission patterns would you be looking for in the pedigree?

If the father has this X-linked recessive trait, is it possible for him to transmit the trait to his sons? How about to his daughters? Be sure to include the ratios of offspring expressing the trait.

If the mother is a carrier for this X-linked recessive trait, is it possible for her to transmit the trait to her sons? How about to his daughters? Be sure to include the ratios of offspring expressing the trait.

If a trait is X-linked dominant in humans, then what types of pedigree transmission patterns would you be looking for in the pedigree?

If the father has this X-linked dominant trait, is it possible for him to transmit the trait to his sons? How about to his daughters? Be sure to include the ratios of offspring expressing the trait.

If the mother has this X-linked dominant trait, is it possible for her to transmit the trait to her sons? How about to her daughters? Be sure to include the ratios of offspring expressing the trait.

How does the pedigree transmission pattern differ for a Y-linked gene versus an X-linked gene (assuming no pseudoautosomal inheritance)?

Describe the inheritance of mitochondrial DNA.