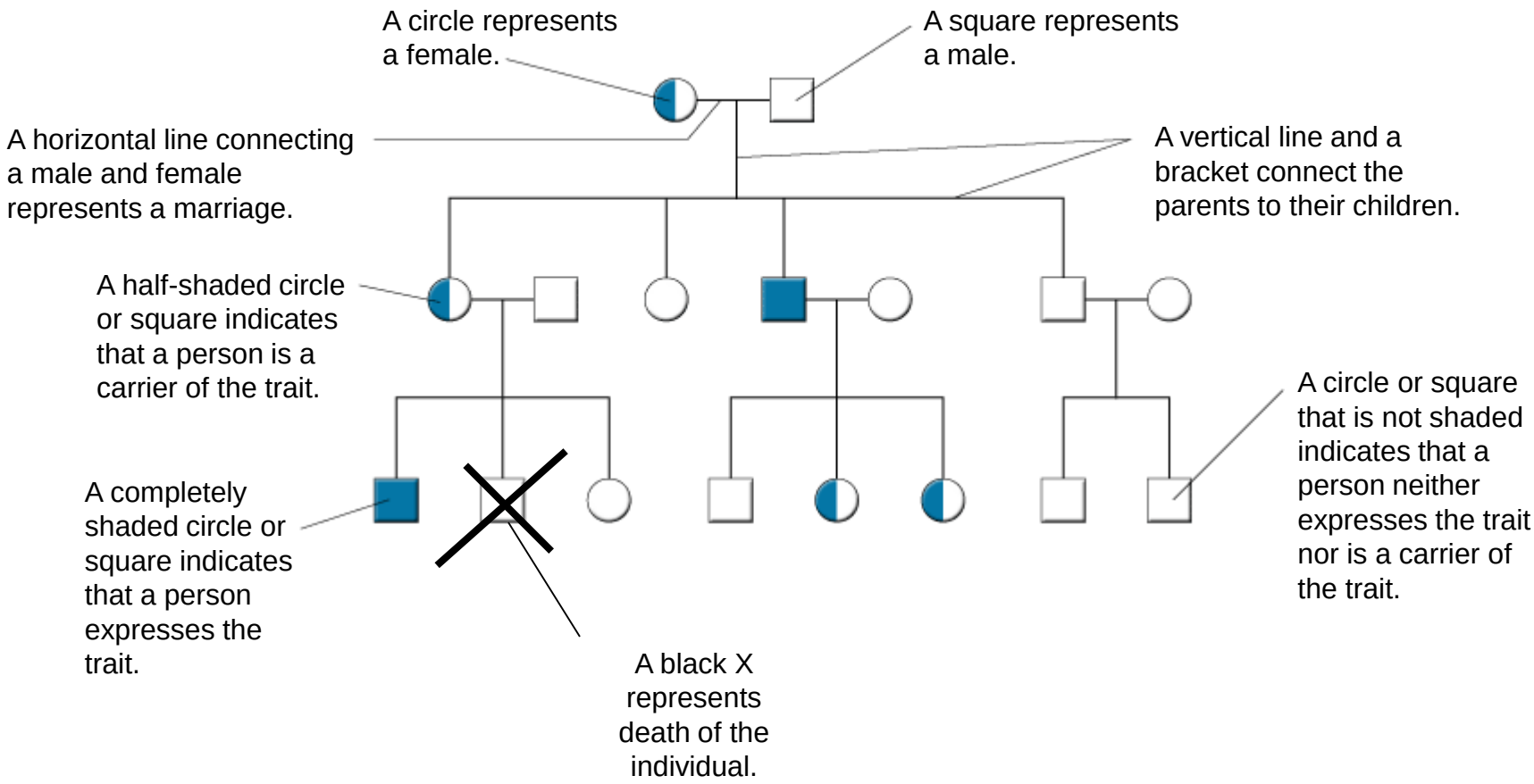
3.3.2 PEDIGREES AND SEX-LINKED TRAITS

OBJECTIVES

- Use a pedigree to interpret patterns of inheritance within a family.
- Explain why X-linked traits are more often expressed in males.
- List three traits that are only carried on sex chromosomes.

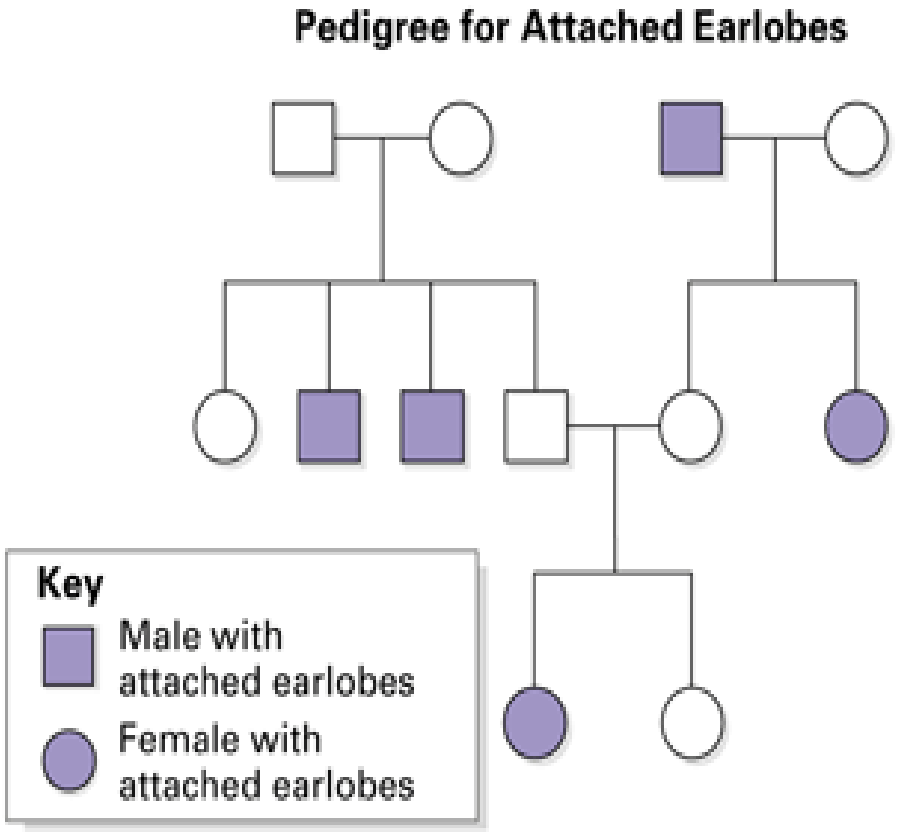
Pedigree Basics

- It is important to study how the trait is passed from one generation to the next. A **pedigree** chart, which shows the relationships within a family, helps geneticists do so.
- Symbols:
  - Squares- males
  - Circles- females
  - Completely shaded in- affected
  - Half shaded in- carrier
  - Not shaded- not affected
  - Horizontal line- marriage
  - Vertical Lines- children

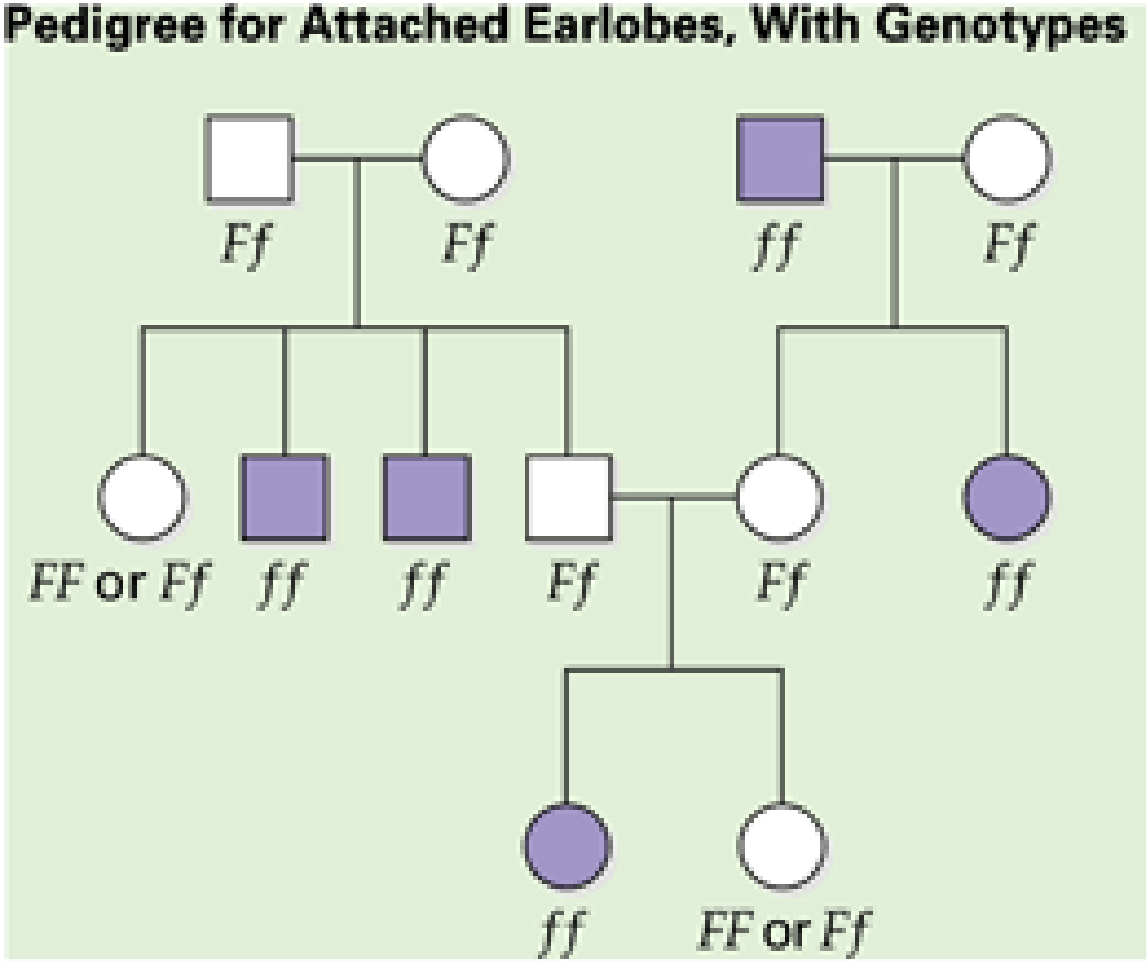

A circle represents a female.
A square represents a male.
A horizontal line connecting a male and female represents a marriage.
A vertical line and a bracket connect the parents to their children.
A half-shaded circle or square indicates that a person is a carrier of the trait.
A circle or square that is not shaded indicates that a person neither expresses the trait nor is a carrier of the trait.
A completely shaded circle or square indicates that a person expresses the trait.
A black X represents death of the individual.

Pedigree for Attached Earlobes

- How many males have attached earlobes?
- Label each individual's genotype.
- Can you determine if the trait for attached earlobes is dominant or recessive from this pedigree? Explain your answer.



Answer to Second Question



Sex Linked Inheritance

- X chromosome is always female
- Y chromosome is always male
  - XXY, XY represents males
- Sex-linked trait
  - Trait that is carried on the X chromosome
    - Y chromosome is **unaffected**
  - Sex-linked traits can be **dominant** or **recessive**
    - Dominant- has one or both dominant alleles
    - Recessive- has both recessive alleles

Sex-Linked Traits

- Remember that humans have 23 pairs of chromosomes and that the 23rd pair are the sex chromosomes. Females are XX and males are XY.
- The traits found on the 23rd X chromosome are called X-linked traits.
- If an X-linked trait is recessive, females have a 1 in 3 chance of inheriting that trait. Males have a 1 in 2 chance of inheriting that trait. For this reason, these recessive phenotypes are more often expressed in males.
  - Ex: colorblindness, hemophilia, and baldness

Baldness Example

- If B= normal hair growth and b=baldness…
- Possible Female Genotypes with their Phenotypes
  - X^BX^B Normal hair growth
  - X^BX^b Normal hair growth
  - X^bX^b Baldness
- Possible Male Genotypes with their Phenotypes
  - X^BY Normal hair growth
  - X^bY Baldness

Identifying Sex-Linked Traits by Analyzing a Pedigree

- To determine if a pedigree is illustrating the inheritance of a sex-linked trait, there are three characteristics you should look for:
  - More males than females are affected
  - Only females are carriers
  - Trait is usually passed from mother to son

Pedigree for Colorblindness