Name Date Class

Section 12.1

Mendelian Inheritance of Human Traits

North Carolina Objectives **Objective 3.03** Interpret and predict patterns of inheritance: Dominant, recessive and intermediate traits; Pedigrees

Before You Read

Certain genetic traits run in families. Skim the Read to Learn section and highlight two important facts about how diseases are passed from generation to generation. Then write the facts you highlighted on the lines below.

Read to Learn

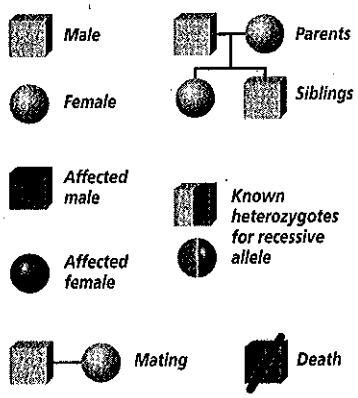
STUDY COACH

Create an Outline Using the headings, make an outline of the information in this section.

Reading Check

1. What is a pedigree?

Pedigree Symbols



Making a Pedigree

Have you ever seen a family tree? What does a family tree show? It shows the relationships among family members. It shows how grandparents, parents, children, aunts, uncles, cousins, and siblings are related.

Geneticists are scientists who study how inherited or genetic traits pass from one generation to the next. Sometimes they use what is called a pedigree to study a family's genetic puzzle. A **pedigree** is a visual diagram of genetic inheritance used by geneticists to map genetic traits. A pedigree uses a set of symbols to identify males and females in a certain family that carry the genetic trait being studied.

Why is a pedigree important?

Perhaps a family has members who suffer from a rare genetic illness. By studying the pedigree, the geneticist will be able to see if it is likely that the trait will be passed on to children or grandchildren. An individual can also study the pedigree to see if there is a risk that he or she will pass along a genetic disease. Studying a family pedigree gives a lot of genetic information about a family.

On a pedigree, circles represent females and squares represent males. Shaded circles and squares represent those who have the trait that is being studied. Unshaded circles and squares represent individuals who do not have the trait. A half-shaded circle or square represents a **carrier**—someone who has a recessive allele for a specific trait. As you have learned, an allele is one of the

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different forms of a gene that exists for a genetic trait. A circle and a square connected by a horizontal line represents parents. A vertical line connects parents with their offspring.

How is a pedigree analyzed?

Look at the illustration to the right. This pedigree shows how a rare, recessive allele is passed from generation to generation. Suppose individual III-1 on the pedigree wanted to know whether she would pass on this allele to her children. We can study the pedigree to answer this question.

We will begin at the top. Individuals I-1 and I-2 are both carriers of the recessive allele for this trait. We know this because they produced II-3, who shows the recessive phenotype. We also know that II-2 is a carrier because she has passed the allele to later generations (IV-2 and IV-4). Because III-1 has a parent (II-2) who is a carrier of the recessive allele, III-1 has a one-in-two chance of also being a carrier of the recessive allele.

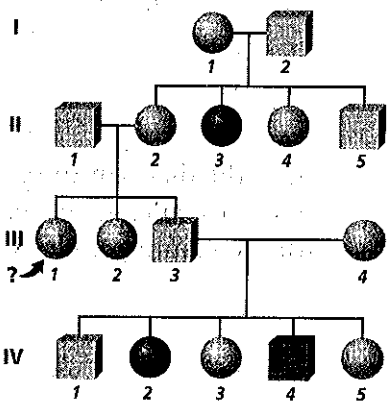
The Punnett square to the right shows the mating of individuals I-1 and I-2. It also shows the probability of individuals II-2 through II-5 receiving the recessive allele.

Reading Check

2. What symbols represent males and females in a pedigree?

_____

_____



Simple Recessive Heredity

Most genetic disorders are caused by recessive alleles. Diseases such as cystic fibrosis, Tay-Sachs (tay saks) disease, and phenylketonuria (fen ul kee tun YOO ree uh), also known as PKU, can be predicted by the use of a pedigree. For an offspring to inherit a recessive trait, both parents must have the recessive allele.

	R	r
R	RR	Rr
r	Rr	rr

Simple Dominant Heredity

Remember that to inherit a dominant trait, only one parent needs to have the dominant allele for that trait.

A cleft chin, a widow's peak hairline, freely hanging earlobes, almond-shaped eyes, and thick lips are examples of dominant traits. Only one allele needs to be present for these traits to show up.

Huntington's disease is caused by a rare dominant allele. There is no effective treatment for Huntington's disease, which causes a breakdown in certain parts of the brain. Because Huntington's disease doesn't occur until a person is between the ages of 30 and 50, many people have already had children before they develop the disease. A pedigree could help people with Huntington's disease in their family better understand their own risks for the disease and for passing it on to future generations.

Think it Over

3. Analyze Which alleles cause genetic disorders such as PKU? (Circle your choice.)

a. recessive
b. dominant

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After You Read

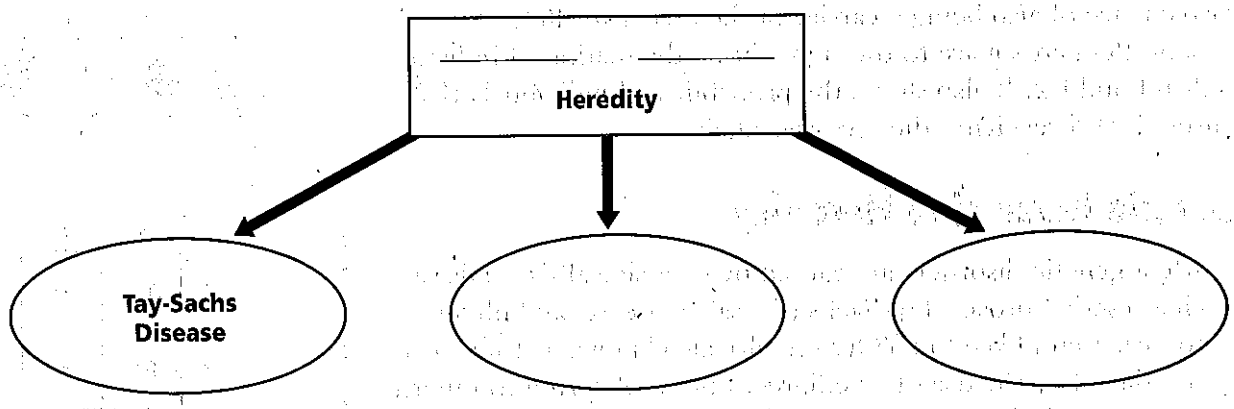
Mini Glossary

carrier: an individual who has a recessive allele for a specific trait

pedigree: visual representation of genetic inheritance used by geneticists to map genetic traits

1. Read the key terms and definitions in the Mini Glossary above. On the lines below, use the words **pedigree** and **carrier** in a sentence.

2. Use the diagram to review what you have learned about the genetic disorders caused by recessive alleles. In the box, fill in the name of the pattern of heredity illustrated. Then fill in the remaining circles with other genetic disorders.



3. In the space below, draw each of the symbols used in a pedigree. Beside each symbol, write a definition of the symbol.

Pedigree Symbols

Visit the Glencoe Science Web site at **science.glencoe.com** to find your biology book and learn more about Mendelian inheritance of human traits.

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