Name _____

Daily Science
Big Idea 1
WEEK 4

Day 1

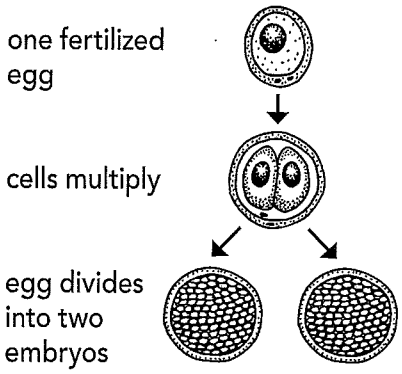
Weekly Question

Are identical twins exactly alike?

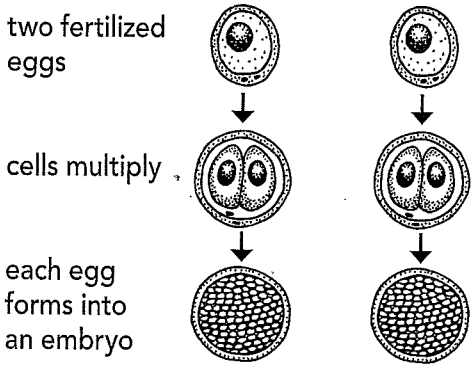
A common belief about identical twins is that they are exactly the same. They look alike, they act alike, and they think alike. But the term "identical" might be misleading. Identical twins are called **monozygotic** twins. *Monozygotic* means that the twins form from a single fertilized egg. The fertilized egg, called a zygote, splits into two parts after conception. This results in two individual **embryos**. The embryos will always be the same sex—either two boys or two girls.

Identical twins are different from fraternal twins. Fraternal twins develop when two separate eggs are fertilized by two sperm. Fraternal twins can be the same sex, or they can be a boy and a girl.

Identical Twins



Fraternal Twins



Vocabulary

embryo
EM-bree-oh
an unborn offspring in development

monozygotic
ma-noh-zie-GAH-tik
formed from a single fertilized egg

A. How are identical twins and fraternal twins alike? How are they different?

_____

_____

_____

B. The prefix *mono-* means "single." Why do you think identical twins are called monozygotic?

_____

_____

Name _____

Daily Science
Big Idea 1
WEEK 4

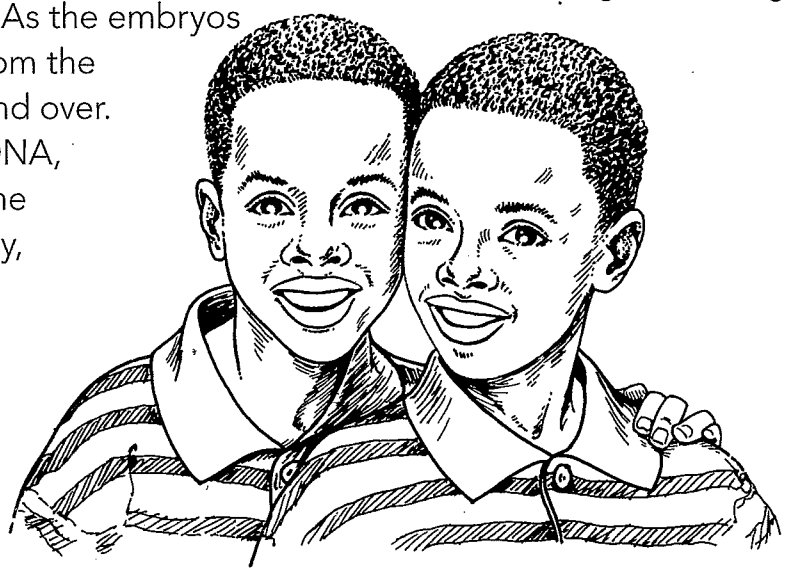
Day 2

Weekly Question

Are identical twins exactly alike?

What makes identical twins so similar? Unlike fraternal twins, identical twins inherit the same set of chromosomes from their parents. A single fertilized egg contains 23 pairs of chromosomes, half from the father and half from the mother. Since fraternal twins come from two separate fertilized eggs, they share only about 50% of the same genetic material—the same amount as siblings born at different times. However, because identical twins come from the same fertilized egg, they share the same DNA.

After a fertilized egg divides into two embryos, the cells of each embryo continue to multiply. As the embryos grow, the set of genes inherited from the original zygote copies itself over and over. Since they started with the same DNA, monozygotic twins are born with the same **genome**. They are, essentially, genetically identical.



Vocabulary

genome
JEE-nohm
the complete set of genes in an organism

Write *true* or *false*.

1. Identical twins share more genetic material than fraternal twins. _____
2. Fraternal twins have more genes in common than regular siblings do. _____
3. Identical twins have the same DNA. _____
4. Parents give each identical twin a separate set of chromosomes. _____
5. Identical twins share about 50% of their genes. _____

Name _____

Daily Science
Big Idea 1
WEEK 4

Day 3

Weekly Question

Are identical twins exactly alike?

Although twins share the same genetic makeup, no two life experiences are exactly the same. The slightest changes in environment can alter a person's traits. In fact, before identical twins are even born, they may go through some changes. For example, most identical twins share a placenta, which is an organ that develops in the mother during pregnancy and provides the fetus with oxygen and nutrients. If one fetus receives more nutrients from the placenta than the other, that baby may weigh more or be taller at birth.

Life experiences outside the womb also impact the development of twins. Studies show that identical twins who live apart have more differing traits than those who grow up in the same household. However, even twins who go to the same school and participate in the same activities do not have exactly the same traits. Many circumstances can lead to differences in children's personalities, interests, and even appearances. For example, one twin could be influenced by a separate group of peers, and thus listen to different music, be more outgoing, and wear different clothes than the other twin. Only the traits that are determined by genes alone, such as eye color, are identical in monozygotic twins.

A. How do life experiences inside and outside of the womb impact a person's traits?

_____

_____

B. What kind of changes in appearance could an identical twin make that are not determined by genetics?

_____

_____

Name _____

Daily Science Big Idea 1 WEEK 4

Day 4

Weekly Question

Are identical twins exactly alike?

Because life experiences and environment can influence traits, identical twins are not exactly alike. In addition, recent research indicates that monozygotic twins may even have some genetic differences. Natural chemical changes occur within a person's genome as he or she ages. The changes act like a gas pedal or a brake, marking certain genes for higher or lower activity. These chemical changes are referred to as the **epigenome**. Scientists have discovered that identical twins are born with a similar epigenome, but as they age, their epigenomes become less and less alike.

In addition to changes in the epigenome, scientists have discovered that not all monozygotic twins are born with the exact same DNA. During early development of the embryos, identical twins might undergo hundreds of genetic mutations called *copy errors*. These copy errors could result in genetic differences between identical twins ranging from personality traits to whether or not a twin suffers from certain diseases.

Vocabulary

epigenome
eh-pih-JEE-nohm
a record of the chemical changes to the DNA of an organism

A. Name two ways that identical twins can be genetically different.

_____

_____

B. Why is the term "identical twins" misleading? Explain your answer.

_____

_____

_____

Talk

Scientists have debated the impact of "nature" (genetics) versus "nurture" (environment) on a person's development for many decades. Which do you think is more important—nature or nurture? Discuss with a partner.