

Genetics of Color-Blindness

Prior Knowledge: For this activity to be meaningful, students need to understand sex-linked traits and how they are passed from parent to offspring. They also need to understand that a person who is a “carrier” for a sex-linked trait does not express the trait, but can pass the affected allele on to offspring.

Materials: Two pennies; Masking tape; Pen

Activity:

1. Select one of the pennies to represent the male parent in this activity. Place a piece of masking tape on both sides of that penny. On one side of this penny write X^c . On the other side write Y. This is Paul, and he is color-blind.
2. Place masking tape on each side of the second penny. On one side of the penny write X^C and on the other side write X^C . This is Jane, and she has normal vision but carries the gene for color blindness.
3. Paul and Jane marry and begin to raise a family. Toss the two pennies and allow them to land on the table. The combination of traits shown on the coins represents the traits of their first child. Was the first child a boy or girl? Was the child color-blind or a carrier? Record your result.
4. Flip the coins seven more times and record your results.

Follow-Up Questions

1. How many boys and girls did Paul and Jane have?
2. How many of the children were color-blind, and how many had normal vision?
3. Do you think color blindness is more common in boys or girls? Why?

Answers

1. Answers will vary. Usually the boy-girl ratio is close, but not always.
2. Answers will vary. For a girl to be color-blind, she has to have $X^c X^c$. For a boy to be colorblind, he would have $X^c Y$.
3. It is more common in boys. They have to inherit only one recessive gene, but girls have to inherit two recessive genes.

Extension

Draw a Punnett square—a diagram showing the expected results of a genetic cross—based on Paul's and Jane's genes for color vision. To do so, draw a square and divide it into four equal sections. Write Paul's genes— X^c and Y—across the top. Write Jane's genes— X^C and X^c —along the side. Write the combinations of genes inside the four boxes. How many of the girls and how many of the boys would you expect to be color-blind?