

Information Molecules
Part I: Catch the Burglar
Part II: All in the Family

Core Content

2.2 Life Sciences

Reproduction and Heredity

Part I: Catch the Burglar

The Challenge

A burglary has been committed and the detectives investigating the crime are frustrated. The burglar has not left any fingerprints at the scene of the crime. The only evidence the detectives have is a few strands of hair found on a windowsill. Is this an unsolvable crime? Not anymore. The detectives can use the DNA molecules of hair to help them identify the criminal. DNA, which carries a person's genetic code, is found in every cell of the body. And just like fingerprints, a DNA pattern is unique to each individual. DNA molecules form strands. Strands form a unique pattern, or "fingerprint." DNA fingerprints help police solve crimes that were once impossible to solve. In this activity you will use Bar Codes as a model of how DNA fingerprints help police catch criminals.

Preassessment

1. Can you explain why biological siblings and parents may have many visible characteristics in common?
2. You visited a horse farm in Lexington and saw colts and their parents. You noticed that one colt had gray eyes and a yearling from the same parents had brown eyes. You also noticed that the father had brown eyes and the mother had gray eyes. How would you explain that the one colt had brown eyes and the other gray eyes?

Performance Tasks

2 index cards

glue

scissors

Universal Product Code (UPC) labels

Procedure (for teacher)

1. Cut the five UPC labels in half at right angles (not parallel) to the bars.

CAUTION: *Be careful when using scissors or other sharp instruments.*

2. Make a model of the suspect's DNA by gluing half of the cut labels end to end on one of the index cards. Label this index card Suspect.

3. Make a model of the DNA evidence found at the crime scene by gluing the remaining cut labels end to end on the second index card. Label this index card Evidence.

4. Compare the DNA fingerprint of the suspect with the DNA evidence found at the scene of the crime.

Observations

1. Do the bars on the Suspect card match up with the bars on the Evidence card?

2. Does the evidence from the crime scene match the DNA fingerprint of the suspect?

3. Guilt or Innocence.

a. Did the bar-codes provide information used to find an unknown (suspect)?

b. Did you find any bar-codes that matched so closely that wondered if you had the real criminal?

c. Do you think this ever happens in real life??

4. Why is the term fingerprinting appropriate for this technique?

5. Read Article #3. Evidence based on DNA fingerprinting is being used in courts today. If you were a member of a jury, how would DNA fingerprint evidence influence your decision on a suspect's guilt or innocence?

Part II: All in the Family

The Challenge

You have probably noticed that members of the same biological family are often alike in some ways. A child may be said to “have her father’s eyes” or to be “the image of her mother.” In this activity you will explore some of the ways in which family members resemble one another.

Preassessment

1. What is DNA? Do all cells have DNA?
2. How does each person come to have a unique strand of DNA?

Performance Tasks

Procedure

1. Choose a family that consists of a mother, father, and at least two children of their biological children who are not adopted or stepchildren. Use biological grandparents when possible. You can use your own family if it fits this description. Otherwise choose the family of a friend, relative, or neighbor. Be sure to get the family’s permission before beginning your project! [Note: Discuss this task with colleagues prior to implementation: Should assignment be voluntary, etc.]
2. You will record your observations in the Data Table. Add more columns to the table if you need more space for additional children.
3. Examine each family member for the traits listed. Some of the traits are illustrated in the diagram. Record your observations in the Data Table.

Observations
DATA TABLE

Trait	Mother	Father	Child 1	Child 2	Child 3
Right-or left-handed					
Freckles: yes or no?					
Cleft chin: yes or no?					
Dimples: yes or no					
Ear lobes: free or attached?					
Eyebrows: connected or not?					
Hair type: curly, wavy, or straight?					
Hair color: dark, light, or red?					

Analysis and Conclusions

1. Did any traits appear in grandparents, parents, as well as in all of their children and grandchildren? If so, what were the traits? _____

2. Were there other traits that appeared in both parents and at least one child? List the traits and the number of children who exhibited each trait. _____

3. Which of the observed traits appeared in only one parent? Did any of the children exhibit the same trait? _____

4. Did any of the traits that appeared in one or more children not appear in either parent? List these traits and the number of children in which they appeared.

5. Do you think it is possible for a trait to appear in a child without appearing in either parent? Why or why not? _____

6. Based on your observations, which traits seem to “run in the family” for this particular family? _____

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Read EITHER article #1 OR #2 AND article #3. [Have students take copies of articles home and read early? Have teacher tape/read articles?]

1. What ideas about genetics/inheritance do both of these articles have in common?
2. There were no tissue/hair samples of the soldier [articles 1, 2] but there were tissue/hair samples of the baby [article #3]. How is it possible that DNA testing was reliable in both cases?