**Types of Traits Biology Grade**: 9-10 **Standard** B.5.6

**Title of investigation:** Relating DNA Code To Amino Acids To Protein Formation And Traits.

**Author(s):**  Rose Calhoun, Marcus Jones, Shelly Gregory, and Laurie Simmons

**Science Standard:**

B.5.6.Recognize that traits can be structural, physiological, or behavioral and can include readily observable characteristics at the organismal level or less recognizable features at the molecular and cellular level.

**Leading Questions/Engagement:**

Have students read the story about twins.

Sally Thompson meets Harry Branaugh in her junior year at a small liberal arts college in Massachusetts. It's a case of love at first sight. In the spring of their senior year, they both have been lucky enough to find jobs in the Boston area, so they plan to get married in the June following graduation.

At their wedding rehearsal dinner, Sally's twin sister Emma meets Harry's twin brother Ken for the first time. It's a case of love at first sight. As Sally and Harry have their first serious argument about who should have told whom about having a twin (and exactly when), Emma and Ken make plans for the evening that don't include the rest of the family. Three months later, they also decide to get married.

The couples keep in touch, and 3 years later Sally and Emma are delighted to discover that they are both expecting (twins?). Emma's due date is in October, and Sally's in December. On December 12th, seventeen hours into labor, Sally is no longer sure she's delighted about the prospect of motherhood, and begins to worry about the child she's about to deliver.

"Why didn't you think of it sooner?" she says to Harry, gripping his arm rather severely. "Identical twins should never marry identical twins. Our child's going to look just like Emma and Ken's little boy." Her first impression of Kenneth, Jr. she recalls, was that he had the sort of face that only a mother and father could love.

Two hours later, Sally is scared to take a look as the obstetrical nurse puts her first child into her arms.

**Questions to ponder:**

Have students generate questions in discussion. You can also add the following:

Will their child look just like his or her "double cousin," Ken, Jr.? Why or why not?

Assuming that Sally is right and the children will look identical, will they also have similar personalities, behavior, and attitudes?

What is the maximum percent of the two childrens' genetic composition that could consist of identical genes (allelic versions)? The minimum percentage?

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|  |  | "http://www.udel.edu/pbl/curric/biology-prob.html"  Last updated Feb. 5, 1999.  Copyright Saunders College Publishing, 1999. |

**Summary of the investigation:** Students meet in small groups and present their conclusions on whiteboards about the problem.

**Equipment used:**

Handouts or a link <http://www.udel.edu/pbl/curric/biology-prob.html> with story and questions.

White boards and markers.

**Description of Procedures, notes (teacher manual):**

Have students work in small groups and read the handout. Students will use whiteboards to attempt to answer the questions. The responses must be based on evidence and not just opinion.

**Follow-up Science Questions:**

How does sexual reproduction tie into this scenario?

How is crossing-over a contributing factor?