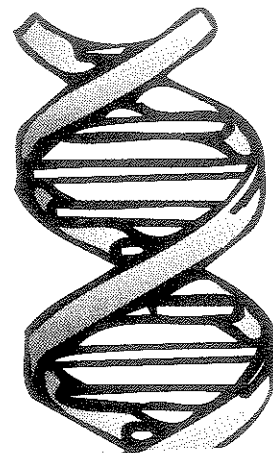


DESIGNER GENES

DESCRIPTION: Students will solve problems using their knowledge of genetics.

A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes

EVENT PARAMETERS: Non-programmable calculators may be used, but no reference materials may be used during the competition. References, training resources and suggested regional/state competition emphasis are available on the Official Science Olympiad Web Page at <http://www.soinc.org>.



THE COMPETITION:

1. This event may be run at stations. Contestants will be given a combination of genetic problems to solve. Knowledge of Mendelian genetics, modern genetics, molecular genetics, biotechnology as it relates to genetics, population genetics and probability is essential. Every attempt should be made to avoid over-emphasis on a particular area.
2. Possible areas to be tested may include: monohybrid, dihybrid, multiple alleles, multifactorial traits, sex-linkage, epistasis, pedigree analysis, nondisjunction, karyotype analysis, DNA analysis technologies such as sequencing, fingerprinting, and PCR, gene therapy, human genetic disorders, bioethics, mitochondrial inheritance, and trinucleotide repeats, and the Hardy-Weinberg principle.
3. Process skills may include observations, inferences, predictions, data analysis, and calculations.

EXAMPLES:

1. Gel electrophoresis set up and running. Photograph showing results of a gel with the lanes labeled: mother, child, male 1 and male 2.
 - a. Identify the apparatus or process (gel electrophoresis).
 - b. According to the results, who is the possible father of the child?
 - c. Why do the bands of DNA in the photograph end up at different locations within their lanes? (Smaller DNA fragments move through the gel faster)
2. You are a genetic counselor and your client, currently sitting in your office, is a 21-year-old female with cystic fibrosis, a disorder with a carrier frequency of $1/25$. She had an older brother who died from cystic fibrosis and an older sister and parents who do not have cystic fibrosis.
 - a. Draw the pedigree and label the proband.
 - b. What is a possible mode of inheritance for this disorder? (autosomal recessive)
 - c. Support your answer in part B by assigning genotypes to each individual.
 - d. Ignoring the effect cystic fibrosis has on reproduction, what is the chance that your client will have a child with cystic fibrosis if she marries someone without cystic fibrosis? ($1/50$)

SCORING: Highest number of correct solutions will determine the winner. Selected questions may be used as tiebreakers.