**Lab Mendelian Genetics-Exploring Genetic Probability**

**CLASS COPY**

**-Revisiting Mendel’s Observations**

**Purpose:**

Students will

1. Learn that probability is strongly related to genetic outcomes.
2. Determine whether probability supports or does not support the 19th century data and conclusions of Gregor Mendel.
3. Be introduced to the probability of crossing two traits at a time, known as dihybrid crosses.

**Vocabulary:**

Gene

Allele

Trait

Gamete

Sperm

Egg

Heterozygous

Homozygous

Probability

Law of Segregation

Law of Independent Assortment

Monohybrid

Dihybrid

Zygote

Fertilization

Punnett Square

**Background:**

When a coin is tossed, it can only one land of two ways-either heads up or tails up. This is similar to when an organism makes gametes. Since an organism receives 2 alleles for a gene , one from the mother of the gamete maker and one from the father of the gamete maker, only one of these alleles will be transferred to a single gamete (sperm or egg)-not both.

If the gamete-making organism is a heterozygous (ex. Aa), the resulting gametes will either have the A (dominant) or the a (recessive) allele.

Mathematically, this situation is described as that the probability of getting one of the alleles (or side of the coin) over the other is 50%, 0.5, ½ or a 1:1 ratio. Mendal summarized this finding in his “Law of Segregation.”

**Part 1: Monohybrid Crosses**

In this Laboratory Activity, each side of a coin will represent an **allele** for a trait. Two coins will be tossed, one representing the **allele** in the sperm and one representing the **allele** in the egg. The results of flipping both coins will represent the resulting **genotype** of the zygote created by the union of the egg and sperm (fertilization). Remember that the zygote is the first somatic cell of a new organism. From this **genotype**, the phenotype can be determined.

The results of flipping these two coins will be used to mimic the **genotypic** and **phenotypic** outcomes recorded by Mendel for a single trait in a hybrid cross, specifically the mating of two **heterozygous** parents.

In pea-plant flowers, the color purple (P) is **dominant** over white (p). A heads-heads combination will represent a **homozygous** **dominant** outcome (purple flowers). A heads-tails combination will stand for a **heterozygous** outcome (purple flowers). A tails-tails combination will represent a **homozygous**-**recessive** outcome (white flower).

**Materials:**

2 Pennies

**Investigative Questions:**

What is the effect of crossing 2 purple-flowered heterozygous parents on the resulting genotypes of the offspring?

**Hypothesis:**

Write a hypothesis for the investigative question and use a Punnett Square and the genotypic ratios for this cross as the “because” part of the hypothesis. Mendel observed this outcome many times during his testing. The results were repeated with great precision.

**Procedure:**

1. Glue the following data table into your journal.
2. Label the **top box** in the left-most column of your data table with the **phenotype that results from a PP genotype**
3. Label the **second box** in the left-most column of your data table with the **phenotype that results from a Pp genotype.**
4. Label the **third** **box** in the left-most column of your data table with **the phenotype that results from a pp genotype.**
5. Record the “expected probability” in the appropriate column of the table.
6. Using 2 pennies, complete 100 simultaneous flips. Heads represents P and tails respresnts p
7. Record your results as appropriate tally marks in the appropriate boxes under “Tally.”
8. When you finish, divide the results of each genotype (under “Tally”) by the total of tosses (100) to obtain the “Experimental Outcome.”

 **Data Table A-Monohybrid Cross**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Phenotype** | **Coin Combination** | **Tally** | **Expected Probability** | **Experimental Outcome** |
|  | PENNY HEADS | PENNY HEADS |  |  |  |
| GENOTYPE(S) |
|  | PENNY HEADS | PENNY TAILS |  |  |  |
| GENOTYPE(S) |
|  | PENNY TAILS | PENNY TAILS |  |  |  |
| GENOTYPE(S) |

 **Data Table A-Monohybrid Cross**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Phenotype** | **Coin Combination** | **Tally** | **Expected Probability** | **Experimental Outcome** |
|  | PENNY HEADS | PENNY HEADS |  |  |  |
| GENOTYPE(S) |
|  | PENNY HEADS | PENNY TAILS |  |  |  |
| GENOTYPE(S) |
|  | PENNY TAILS | PENNY TAILS |  |  |  |
| GENOTYPE(S) |