**Objectives: I am Learning to…**

* Identify Mendel’s law of segregation and the law of independent assortment
* Explain how the process of meiosis reveals the mechanism behind Mendel’s Laws
* Define and provide examples of genetic terms

**Procedure**

1. Remove all the chromosomes from the bag. One partner should take the white chromosome (chromosomes for the father) and the other partner will take the orange chromosome (chromosomes for the mother)
2. Place the chromosomes face down so the letters do not show and arrange them in pairs based on the size. There will will be eight sets of chromosome pairs.
3. Without turning the chromosomes over, the “Father” should pick one white chromosome from each pair and set them aside. The “Mother” should pick one orange chromosome from each pair and set them aside. Place all chromosomes NOT picked back into the parent bag.
4. Combine the piles from the two parents. Form new pairs by matching the white and orange chromosomes based on the size. You and your partner should end up with eight pairs of chromosomes, and each pair should contain one white and one orange chromosome.
5. Turn over the white and orange pairs of chromosomes. These represent a new baby. Record the alleles contributed by the father and the mother under Table 2 in the results section. Also, record the genotype and phenotype of the baby using the Key to Traits table, and state whether the genotype is homozygous or heterozygous.
6. After filling out the table, return all chromosomes to the bag.
7. Based upon your phenotype and the Table 1: Key to Traits table below, construct your Baby Rebop.
8. Once everyone is has completed their Rebop, compare your Rebop’s characteristics to the other Rebops.

**Table 1: Key to Traits**

|  |  |  |
| --- | --- | --- |
| **Antenna (Floral Wire)** | **Humps (Push Pin)** | **Nose Color (Push Pin)** |
| AA = 2 Antenna  Aa = 1 Antennae  aa = No Antennae | MM = 1 Green Hump  Mm = 1 Green + 1 White Hump  mm = 1 White Hump | QQ = Red Nose  Qq = Orange Nose  qq = Yellow Nose |
| **Tall Style (Pipe Cleaner)** | **Eye Number (Push Pin)** | **Leg Color (Push Pin)** |
| TT = Curly Tail  Tt = Curly Tail  tt = Straight Tail | EE = 2 Eyes  Ee = 2 Eyes  ee = 3 Eyes | LL = Blue Legs  Ll = Blue Legs  ll = Green Legs |
| **Gender (Yarn)** | **Number Body Segments (Styrofoam Sphere)** | |
| XX = Female, include hair  XY = Male, no hair | DD = 2 Body Segments  Dd = 2 Body Segments  dd = 3 Body Segments | |

**Table 2: Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trait** | **Allele from Father** | **Allele from Mother** | **Genotype** | **Homozygous or Heterozygous** | **Phenotype** |
| Antenna (A) |  |  |  |  |  |
| Nose (Q) |  |  |  |  |  |
| Eyes (E) |  |  |  |  |  |
| Body Segments (D) |  |  |  |  |  |
| Humps (M) |  |  |  |  |  |
| Tail (T) |  |  |  |  |  |
| Legs (L) |  |  |  |  |  |
| Gender (X,Y) |  |  |  |  |  |

**Analysis**

1. At the beginning of the activity, you were given a set of chromosomes that belonged either to the mother or to the father Rebop.
   1. How many chromosomes are in the Rebop genome?
   2. How many pairs of homologous chromosomes do Rebops have?
   3. What does it mean for the chromosomes to be homologous?
   4. Are Rebops diploid or haploid? Explain how you know.
2. In Step 3 you took one chromosome from each homologous pair and set them aside in a pile.
   1. Which of Mendel’s laws is demonstrated in this step?
   2. In the real world, what is this process, which reduced the chromosome number in half, called?
   3. What type of cells result from this process?
   4. How many chromosomes are in each cell resulting from this process?
   5. Are these gamete cells diploid or haploid? Explain how you know.
3. In Step 4 you combined the two piles together in order to produce an offspring.
   1. In the real world, what is the name of the process where the male and female gametes combine?
   2. What is the name of the cell resulting from this combination?
   3. How many chromosomes are in this cell?
   4. Is this cell diploid or haploid? Explain how you know.
4. Explain why the baby Rebop is similar to both parents, but not identical to either one.
5. The traits for tail style, eye number, leg color, and body segments demonstrate the traditional or “simple” inheritance pattern identified Mendel. Identify the traits that do not follow this pattern and in your own words describe how the phenotypes were effected by the combination of alleles.