

Parents \_\_\_\_\_  
\_\_\_\_\_

## Pipe Cleaner Babies

In this activity you will play the role of a parent, your lab partner will play the role of the other parent. You will use chromosome and gene models to create four offspring and determine their genotypes and phenotypes. Then mathematically, you will determine the probability of having offspring with different traits.

### How to Use the Model

You will receive a baggie with pipe cleaners and beads. The pipe cleaners represent chromosomes and the beads represent genes located on the chromosomes. In humans, there are 23 pairs of chromosomes and thousands of genes, but for this exercise, we will only focus on a few.

Without opening the bag, notice that you have four white and two colored pipe cleaners. If you have two pink chromosomes, you are to play the role of female (XX). If you have one pink and one blue, you are to play the role of the male (XY).

1. What do the pipe cleaners represent? \_\_\_\_\_
2. What do the beads represent? \_\_\_\_\_
3. Humans have \_\_\_\_\_ pairs of chromosomes.
4. If you have two pink pipecleaners, you are playing the role of \_\_\_\_\_
5. The blue pipecleaner represents the \_\_\_\_\_ chromosome.

### Figure out the parents' traits

Remove the chromosomes from the bag, but make sure you do NOT mix up you and your partner's chromosomes. Arrange the chromosomes in order of size, you should have two long white pipecleaners, two shorter pipecleaners, and the two colored pipecleaners.

The white pairs represent HOMOLOGOUS CHROMOSOMES.

The colored pairs represent SEX CHROMOSOMES

**Eye Color** (longer white pipe cleaners)

Grey bead represents the dominant gene --- brown eyes

Blue bead represents the recessive gene --- blue eyes

BB = brown eyes

Bb = brown eyes

bb = blue eyes

What color eyes does the “mom” have? \_\_\_\_\_ What is her genotype? \_\_\_\_\_

What color eyes does the “dad” have? \_\_\_\_\_ What is his genotype? \_\_\_\_\_

**Hair Color** (shorter white pipe cleaners)

The red bead represents the dominant gene -- dark hair

The ivory bead represents the recessive gene blonde hair

DD = dark hair

Dd = dark hair

dd = blonde hair

What color hair does “mom” have ? \_\_\_\_\_ What is her genotype? \_\_\_\_\_

What color hair does “dad” have? \_\_\_\_\_ What is his genotype? \_\_\_\_\_

**Hemophilia** (sex chromosomes, colored pipe cleaners)

The purple bead represents the dominant gene -- normal

The clear bead represents the recessive gene -- hemophiliac

In girls: HH = normal

Hh = normal (carrier)

hh = hemophiliac

In boys: H = normal

h = hemophiliac

What is “mom’s” genotype? \_\_\_\_\_ Is she a carrier? \_\_\_\_\_

What is “dad’s” genotype? \_\_\_\_\_

Why doesn’t dad get two alleles for this trait? \_\_\_\_\_

## Time to Start Your Family

--The “dad” places one set of the homologous pairs (ex: that longer set) behind his back, with a chromosome in each hand. The “mom” picks the hand she wants for the child. Lay this chromosome on the table in front of you and set the other aside.

-- Repeat this procedure for the other homologous pair (ex: shorter set) and for the sex chromosomes. Its should be noted that if the blue chromosome gets chosen from the sex chromosomes, the child in this cross is going to be a boy.

--Now the “mom” places one set of the homologous pairs behind her back and the male chooses.

-- The chromosomes chosen and set on the table in front of you are the genes your first child received.

## Determine the Traits of Your First Child

Arrange the chromosomes into homologous pairs and figure out what phenotypes (appearance or trait) the offspring has.

What is the sex of the child? \_\_\_\_\_

What color eyes does the child have? \_\_\_\_\_ Genotype? \_\_\_\_\_

What color hair does the child have? \_\_\_\_\_ Genotype? \_\_\_\_\_

Is the child a hemophiliac? \_\_\_\_\_ Is the child a carrier for hemophilia? \_\_\_\_\_

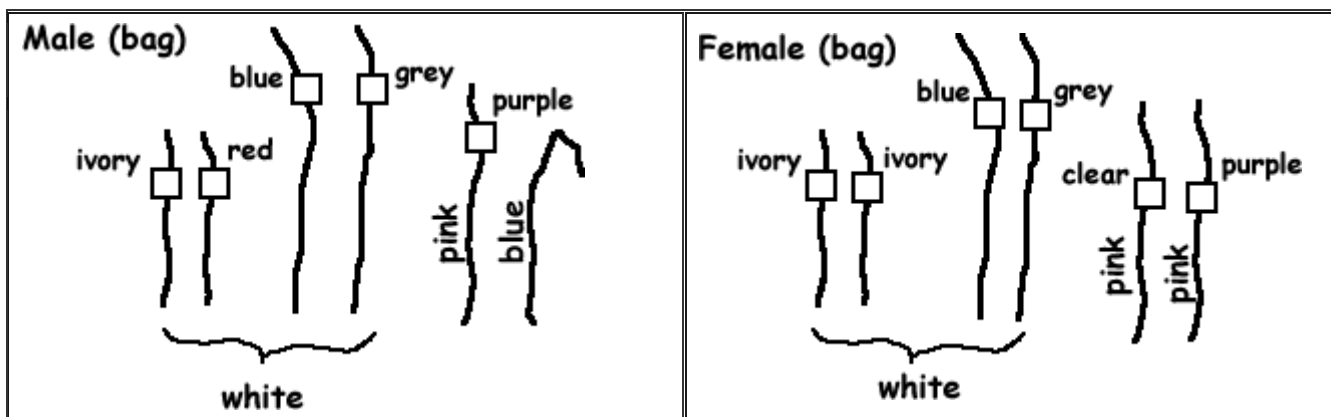
## Data Table

Go to the last page and see the data table, the first group is you and your partner. You are going to have 4 children. Repeat the procedure you used to make you first child to make 3 others. Fill out their traits on the table.

When you are finished, you will post your data on the board. Other groups will also post their children's data. Fill out the entire chart with all the parents in the class.

## Replace all Chromosome into the Correct Baggie

Make sure you have the right chromosomes in the bag and return.



# Analysis

---On a separate page, answer the following. Each person in the group must fill out their own analysis section.

1. Create a punnet square for each of the crosses, using your parents. (You'll have a square for hair color, eye color, and hemophilia)
2. Explain why women are carrier's for the disease hemophilia. Why do their sons, but not their daughters get the disease?
3. Describe the difference between how normal traits are inherited and how sex linked traits are inherited.
4. The data table where all the data is combined, shows how many ACTUAL offspring would have each of the traits. The punnet squares (from #1) show the PREDICTED ratios. Compare the actual to predicted ratios for all three traits.
5. Notice on the data table that no female has the disease hemophilia. Explain why.
6. If you knew you were a carrier for hemophilia (or your wife was), would you choose to have children. Explain your reasons.

**\*\*Turn in these pages (with both names), the data table, and the answers to analysis (which should have a single name)**

	Eye color	Hair Color	Hemophilia	Sex	<u>Compile Data</u>
<b>Group 1</b>					Total number of babies? _____
					Number of girls? _____
					Number of boys? _____
<b>Group 2</b>					Number of children with brown eyes _____
					Number of children with blue eyes _____
					Number of children with dark hair _____
<b>Group 3</b>					Number of children with blonde _____
<b>Group 4</b>					

					hair _____
					Number of girls with hemophilia _____
<b>Group 5</b>					
					Number of boys with hemophilia _____
<b>Group 6</b>					<b>Convert your data to percentages.</b> To get the percents, divide the number you have by the total number and x 100.
					Girls _____%
<b>Group 7</b>					Boys _____%
					Brown eyes _____%
					Blue eyes _____%
<b>Group 8</b>					Dark hair _____%
					Blonde hair _____%
<b>Group 9</b>					Hemophilic boys _____%
					Hemophilic girls _____%
<b>Group 10</b>					
<b>Group 11</b>					

If you need to add more data, continue the table on the back.