Name _____ Date _____ Period _____

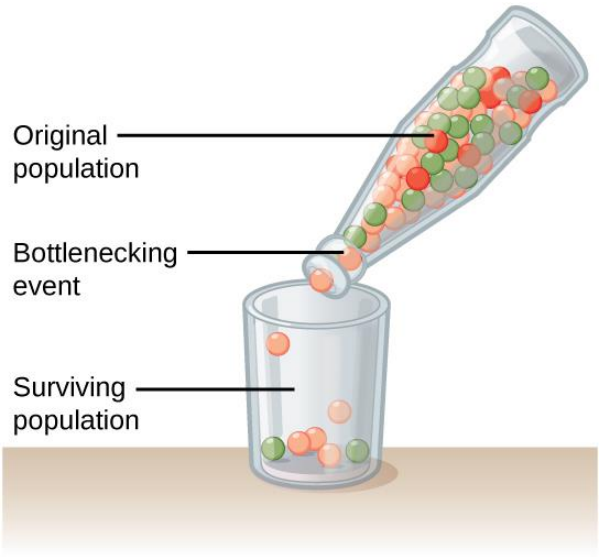
Lab: Investigating Genetic Drift

HONORS BIOLOGY: UNIT 8

BACKGROUND: It should now be clear that population size will affect the number of alleles present in a population. But small population sizes also introduce a random element called genetic drift into the population genetics of organisms.

What is genetic drift?

Genetic drift is **change in allele frequencies** in a population from generation to generation that occurs **due to chance events**. To be more exact, genetic drift is change due to "sampling error" in selecting the alleles for the next generation from the gene pool of the current generation. Although genetic drift happens in populations of all sizes, its effects tend to be stronger in small populations. (https://www.khanacademy.org)



Key points

- **Genetic drift** is a mechanism of evolution in which allele frequencies of a population change over generations due to chance (sampling error).
- Genetic drift occurs in all populations, but its effects are strongest in small populations.
- Genetic drift may result in the loss of some alleles (including beneficial ones) and the fixation, or rise to 100 percent frequency, of other alleles.
- Genetic drift can have major effects when a population is sharply reduced in size by a natural disaster (bottleneck effect) or when a small group splits off from the main population to found a colony (founder effect)
- The ***bottleneck effect*** is an extreme example of genetic drift that happens when the size of a population is severely reduced. Events like natural disasters (earthquakes, floods, fires) can decimate a population, killing most indviduals and leaving behind a small, random assortment of survivors.
- The ***founder effect*** is another extreme example of drift, one that occurs when a small group of individuals breaks off from a larger population to establish a colony. The new colony is isolated from the original population, and the founding individuals may not represent the full genetic diversity of the original population.

MATERIALS PROVIDED:

- Colored M&Ms or Skittles (*these represent the species* "***Colored candies***")
- Small cups
- Paper towels
- Newsprint (*to lay candy on during experiment*)
- Coffee stirrers (*use these to avoid touching M&Ms with your fingers*)

PROCEDURE: *In this lab, you will investigate the phenomena of **genetic drift**. The goal is to understand how genetic drift can change the **allele frequencies** of a resulting population.*

1. Read the background information at the beginning of the lab to understand the different modes of genetic drift. Conduct additional research on genetic drift using your textbook, phones, or Chromebooks before you begin your experiment.
2. Once you have read the background information, describe in your own words what **genetic drift** is below.

   Genetic drift is:

3. Gather materials listed and form groups of 3-4 students per lab table.
4. Lay out newsprint on table and randomly pour M & M's or Skittles onto it.

   NOTE: *Avoid touching the candies with your fingers. Use Popsicle sticks to move candies around.*

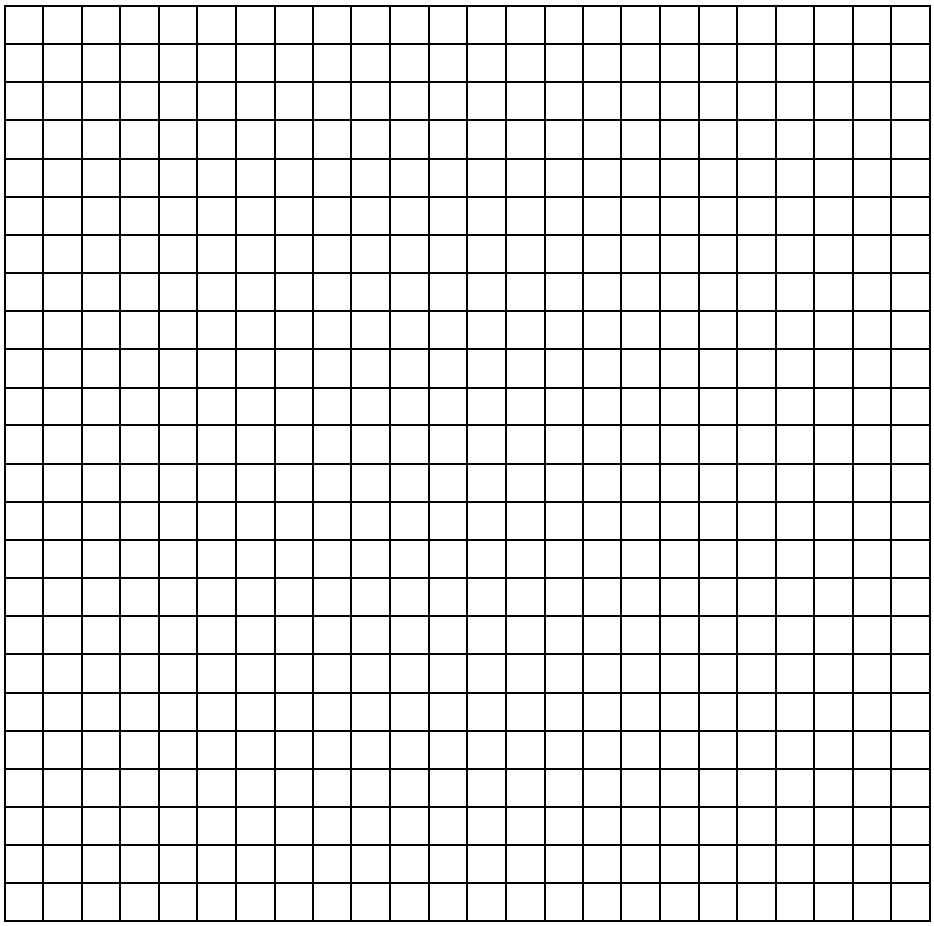
   IMPORTANT: ***If anyone in your group has a nut allergy, use Skittles instead of M & M's.***
5. Record the colors and number of each color of candies and record in Data Table #1.
6. Select one of your group members to randomly (*without looking*) select a small group of candies (5-10) using a small cup and drag them to the side.
7. Observe the number and color of resulting small genetic drift population and record in Data Table #1 and complete data table by calculating the percentages of each color in original and genetic drift population.
8. Clean-up lab area and dispense (eat) test subjects if you wish. (*Colored candies)*
9. Graph your data in graph provided and complete Analysis Questions

Data Table #1

Color	Original Population		Genetic Drift Population	
	# of candies	**% of population**	**# of candies**	**% of population**

ANALYSIS QUESTIONS: Every student to answer questions independently. Each answer must be a minimum of **one paragraph (*5 sentences minimum*)**

1. Graph your data. Remember to label axes and give your graph a title. This will be a **Bar Graph**.



2. Clearly **describe** the results of your experiment. How does the new (smaller) population differ from the original population?

3. Look at the colors in your genetic drift population and the corresponding percentages. Now, compare those to the same colors/percentages in the original population (for example, in the genetic drift population, red might have had percentage of 50% while in the original population red was only 16%). Write these comparisons down in a list format.

4. Does the new genetic drift population (resulting population) accurately represent the original population? Explain by citing your data.

5. What colors in the original population are NOT represented in the genetic drift population (resulting population)? What effect does this have on the genetic diversity of the resulting population?

6. Let's assume that the M&M's are green colored Praying Mantises and that they were placed into a new environment consisting of lots of greenery and many bright red flowers. Which colors in the genetic drift population would have better fitness in this new environment? Why/how? How might that affect the alleles for those individuals?

7. Which M&M's (Praying Mantises) would have less fitness in question number 6? Why/how? What might happen to the alleles for those individuals that have less fitness?