**Lab: Black-Footed Ferrets** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Background:**

A genetic population bottleneck occurs when a **population experiences a** sharp reduction in size of a population due to environmental events (such as earthquakes, floods, fires, or droughts) or human activities. Using the color code key below (paper color = gene characteristic), evaluate the generic characteristics your hypothetical black-footed ferret population received through the genetic bottleneck event. Then answer the questions related to genetic diversity, bottleneck events, and characteristics.

**Procedure:**

1. Sort, count, and record your population’s genes (color squares).

Black: precise vision

Orange: accurate smell

Red: healthy reproduction

Pink: strong claws/lets

Brown: immunity to canine distemper

Purple: accurate hearing

Green: agility

Yellow: camouflage

Dark blue: healthy jaw

Light blue: jaw deformity

Gene Frequency:

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| **Gene** | **Frequency** |
| Precise Vision |  |
| Accurate Smell |  |
| High Rate of Reproduction |  |
| Strong Claws/Legs |  |
| Immunity to Canine Distemper |  |
| Accurate Hearing |  |
| Agility |  |
| Camouflage |  |
| Healthy Jaw |  |
| Jaw Deformity |  |

1. Calculate the percent genetic diversity of your hypothetical black-footed ferret population. 10 genes represent 100% genetic diversity in the original black-footed ferret population.
2. How many genes do you have? \_\_\_\_\_\_\_
3. Calculate the percentage of possible genes within your population: \_\_\_\_\_\_\_\_\_\_%
4. Create a bar graph showing the population’s gene frequency.
   1. Title (compares independent and dependent variables)
   2. Frequency of Gene: Y-axis label and scale
   3. Gene/Characteristic: X-axis label and scale
   4. Color-coded to match genes received

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1. Impact of genes on ferret population:

In order for your population to pass along genes from one generation to the next, there must be at least 3 copies of the same gene in the population. Any less than that means only a few individuals will be impacted instead the population as a whole.

* 1. On the graph, indicate with a horizontal line the threshold for genes to be passed on to the next generation.
  2. In what ways will your population of ferrets be strong?
  3. In what ways might your population of ferrets by weak?

**Analysis/Conclusions:**

Using the situations below that have taken place where your hypothetical back-footed population lives, what is the impact to your population? Use the genetic information to decide whether your ferret population with survive and thrive or if they will die off. Discuss what will happen to your population based on their genes and the event.

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| **Scenario** | **Impact on Population**  (Detailed discussion of how the event and your population’s genes result in said impact) |
| 1. A farmer tries to protect his wheat fields by exterminating resident prairie dogs. | Impact:  Discussion: |
| 1. The average female ferret only produces one kit per year. | Impact:  Discussion: |
| 1. Ranchers allow their dogs to run loose (can carry canine distemper). | Impact:  Discussion: |
| 1. A new group of captive-born black-footed ferrets is released at a nearby location. | Impact:  Discussion: |
| 1. A coyote prowls at night. (Can have a strong scent) | Impact:  Discussion: |
| 1. A great horned own relies on its keen eyesight to spot potential prey in the dark. (Visual hunter) | Impact:  Discussion: |
| 1. A predatory badger sneaks around the prairie dog town. (Makes only a small amount of noise) | Impact:  Discussion: |
| 1. Drought causes the prairie soil to compact and harden, making it harder to burrow into the soil. | Impact:  Discussion: |