

Natural Selection Model

Purpose: To model natural selection in a controlled experiment.

Question: Does the colour of a disc affect its ability to survive in the classroom environment where grade 11 students are 'hunting' for them by sight?

Hypothesis:

Procedure:

Part A: Variations, Selective Pressure and Survival

1. Prey (coloured discs) will be hidden throughout the classroom.
2. At a pre-determined signal, predators will have 2 minutes to forage for food and collect as many animals as possible.
3. After this hunting time, all remaining (uneaten) prey are gathered and added to the reproductive population.

Part B: Variations and Inheritance

4. Reproducers place all surviving (uneaten) prey in a dish and draw out random mating pairs and lay them on the table in columns of 2 (2 parents). Since the alleles for colour are co-dominant, each mating pair will yield 2 offspring which are the same colour as the parents. A red and yellow mating pair will contribute a red and yellow offspring and so on.
5. The number of individuals of each colour will be counted and recorded after the simulated mating.
6. Prey will then have 3 minutes to hide the next generation of discs.
7. Prey and predators run the simulation again and record prey numbers after the second generation (2nd mating cycle). Continue the simulation for at least 5 generations.

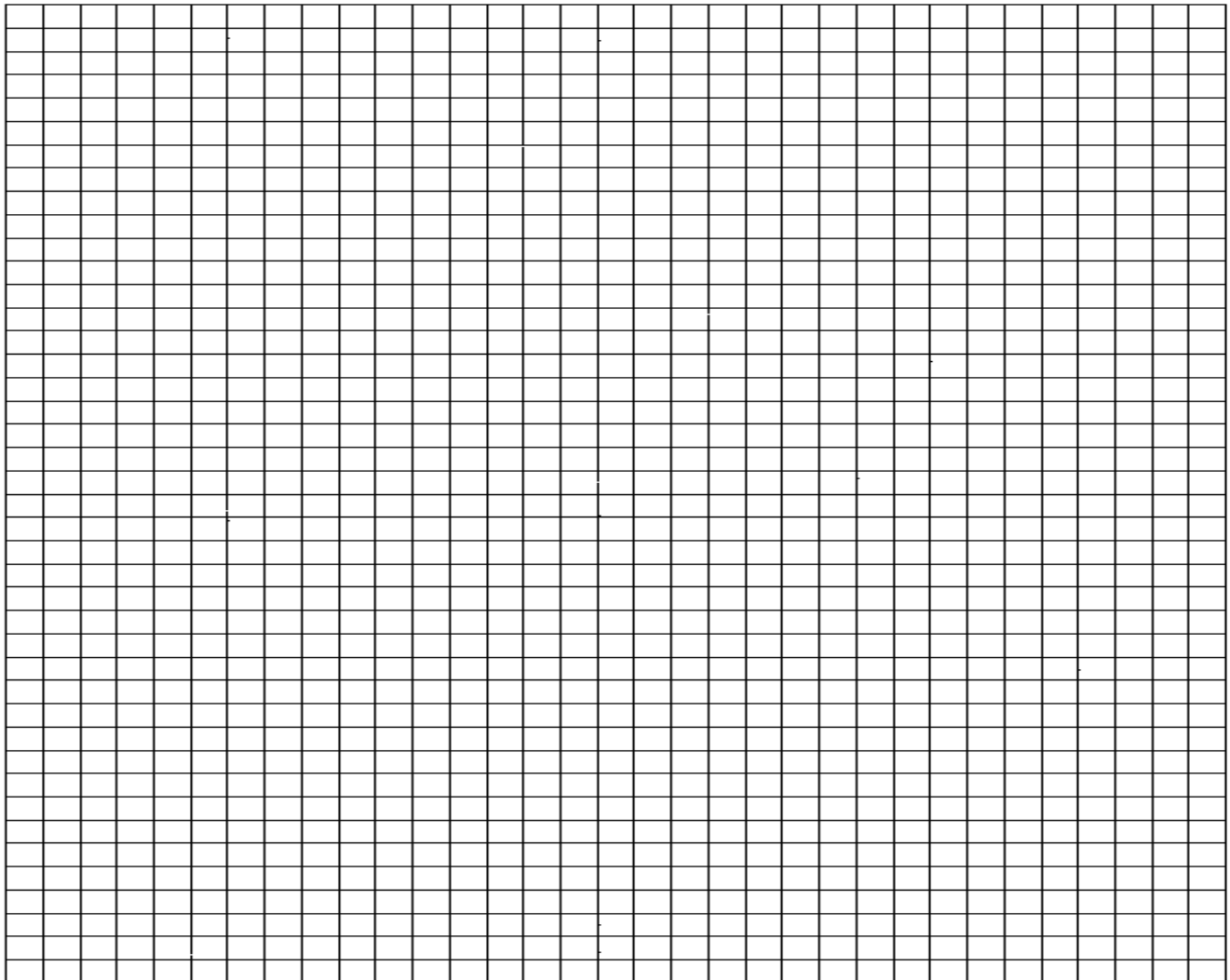
* Discs must be half visible, and below the wood trim in the class. If not, our data will be skewed.

Controlled variables:	Independent variable:	Dependent variable:

Data Table:

Colour	Starting generation	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Starting frequency	Final frequency
White	25						25 / 125 =	
Yellow	25							
Red	25							
Purple	25							
Orange	25							

Graph: (use a line graph, do not forget a legend, each disc colour needs its own line)



Conclusion:

1. Does the data from this lab support or refute your hypothesis? EXPLAIN. (3 marks)

2. Go back and look at the original question for this lab. How would you answer this question after completing the lab and collecting data for 5 generations? (3 marks)
 - a. **Hints:**
 - i. Did you see any differential survival and therefore differential reproduction in the population? (Did colour matter to the survival of prey?)

 - ii. Was the experiment controlled enough to make any valid conclusions? EXPLAIN.

 - iii. Were the selective pressures on prey severe enough for natural (artificial) selection to be observed?

Discussion Questions: (15 marks)

1. Describe the sources of variation in offspring. That is, why are offspring often variations of their parents? (2 marks)

2. What is a gene pool? What is the original frequency of each phenotype in the gene pool? (2 marks)

3. After the final generation, what is the new frequency of each phenotype in the gene pool? (1 mark)

4. Why is the frequency of each phenotype in the gene pool valuable data? (1 mark)

5. Based on your data, can you comfortably state which animals are best adapted and which animals are most poorly adapted to their environment? Explain. (2 marks)

6. In this lab did the overall population of prey go up or down? What does this indicate about the predators? (2 marks)

7. As prey became more difficult to find the predators, selective pressure increased. What **predator** strategies, behaviours and traits do you think would be selected for in a natural population? (2 marks)

8. Explain how this laboratory model attempts to explain the process of natural selection. (1 mark)

9. Modeling natural selection in an artificial environment like the classroom with only one independent variable does not accurately represent natural selection in 'real' environments.

10. Describe ONE aspect of our model that helps us understand natural selection and describe ONE aspect of our model, which you might consider unrealistic in a "real" environment. (2 marks)