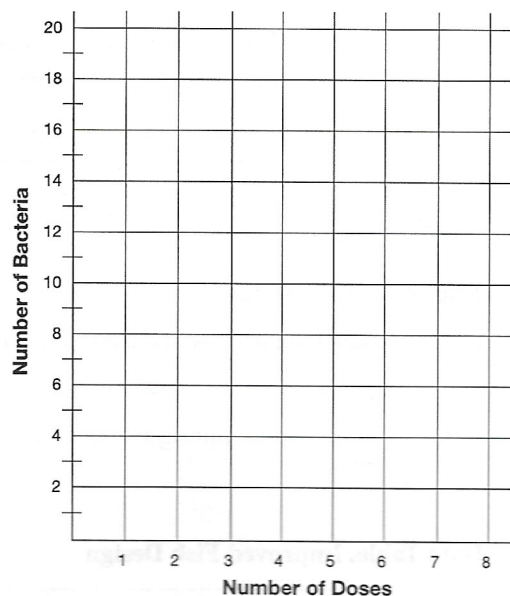# Natural Selection Worksheet

Part 2. Antibiotic Resistance Demonstration

Data Table and Graph

Dose Number	Number Rolled	Bacterial Population			TOTAL
		Low Resistance (Red)	Medium Resistance (Blue)	High Resistance (Yellow)	
Initial	N/A	13	6	1	20
1					
2					
3					
4					
5					
6					
7					
8					

Post-Lab Questions (*Answer on a separate sheet of paper.*)

1. What general pattern was observed regarding the total number of bacteria present initially and the number remaining after eight doses?

2. Compare the initial and final counts of the least resistant bacteria. Explain any trends that were observed.

3. Name the strain of bacteria that had the highest fitness without the antibiotic and give one piece of evidence to support this.

4. Name the strain of bacteria that had the highest fitness with the antibiotic and give one piece of evidence to support this.

5. In this simulation, the three different strains had different reactions to the antibiotic treatment. Describe one way that the strains of real bacteria may be different from one another.

6. In this simulation, the antibiotic changed the environment. Describe one example of an environment that has changed in a way that challenged the survival of a population of organisms.

Part 3. Engineering Design for Fitness (*Use a separate sheet of paper to complete the following steps in the design process.*)

Original Fish Design

Draw and label the original design of the fish you tested.

Data Table. Original Fish Design

Equations:

$$\text{Speed} = \frac{\text{distance (cm)}}{\text{time (s)}} \qquad \text{Average} = \frac{(\text{trial 1} + \text{trial 2} + \text{trial 3})}{3}$$

Trials	Distance (cm)	Time (s)	Speed (cm/s)	Observations—Include possible improvements for this design
1				
2				
3				
Average				

Improved Fish Design

Draw and label the improved design of the fish you tested. Label features that have been altered.

Data Table. Improved Fish Design

Trials	Distance (cm)	Time (s)	Speed (cm/s)	Observations—Include possible improvements for this design
1				
2				
3				
Average				

Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. Describe the reasoning behind your original design. What features were included to make it have the fastest speed?

2. Compare your data with other groups. Based on the data, would evidence support or refute the claim that "Your original fish design displayed high fitness"? Explain the reasoning for your answer.

3. Describe an environment where nature would select for your fish body shape.

4. Describe an environment where nature would select against your fish body shape.

5. Describe changes made to the original design in order to improve the speed of the fish. Using evidence, explain whether you were successful or unsuccessful.

6. Describe any limitations present in your data (discuss possible sources of error).

7. List the similarities and differences, focusing on the structures and functions, between a real fish and your model.

Final Analysis *(Use a separate sheet of paper to answer the following questions.)*

1. Using a claims, evidence and reasoning model, explain how natural selection and artificial selection connect to fitness.

   a. Propose a claim based in scientific understanding.

   b. Discuss specific evidence from the engineering design activity.

   c. Discuss the reasoning for the claim based on connections to the POGIL™ activity, the simulation and the engineering design activity.