Modelling Coevolution **Name: _____**

Flowering plants and the animals that pollinate their flowers include many examples of coevolving species. In this investigation, you will model how these plants and animals evolve in response to one another.

Problem: How do flowering plants and their pollinators coevolve?

Materials:

- Long forceps
- Spoon
- Dried peas
- 3-25 mL graduated cylinders
- 3-100mL beakers
- Timer

Method:

1. Work in groups of three. Each member of the group must choose one type of bird beak. Put your names in the table below.

Group Member #	Bird beak type	Name
1	Forceps	
2	Spoon	
3	2 fingertips	

2. The materials represent:

Materials	What they represent
Beakers	Short, open flowers
Graduated cylinders	Long narrow flowers
Dried Peas	Flower's nectar (the bird's food)

3. Fill the 3 beakers and the 3 graduated cylinders halfway with dried peas. Each member will have one beaker and one graduated cylinder in front of them.
4. For 1 minute, using the beak type that you chose remove one pea at a time from the beaker. Do not move or tip the beaker as you do this. **Safety:** Be careful not to break the glassware.
5. Record the number of peas removed in the data table below.
6. To produce seeds, a flower must be pollinated by a member of its own species. Assume that 1 flower was pollinated for every 5 peas removed. Record the number of pollinations for each bird.

Data Table				
Beak Type	**Individual Data**		**Class Average**	
	Peas	**Pollinations**	**Peas**	**Pollinations**
Forceps				
Spoon				
Fingers				

7. Repeat steps 4-6, using the graduated cylinders instead of the beakers.
8. Record your data on the board at the front of the room. Averages will be calculated by the class. Please record those in the data table above.

Variables and Hypothesis:

Independent Variable: _____

Dependent Variable: _____

Controls: _____

Hypothesis for each <u>beak</u> type:

If _____ (independent variable)

then _____ (dependent variable)

because _____

_____

_____

_____

(scientific reasoning – related to natural selection)

If _____ (independent variable)

then _____ (dependent variable)

because _____

_____

_____

_____

(scientific reasoning – related to natural selection)

If _____ (independent variable)

then _____ (dependent variable)

because _____

_____

_____

_____

(scientific reasoning – related to natural selection)

Data Analysis

1. Describe **<u>all</u>** of the results (from the data table) including scientific reasoning. Include which beak and which flower must have co-evolved and why (including why you think that and why that makes sense in terms of co-evolution).

2. Was your hypothesis valid (shown to be correct)? Yes or no, why or why not?

3. List some positive aspects of the method (specifically about the variables, measurement methods and controls).

4. List some concern/negatives about the method (specifically about the variables, measurement methods and controls).

5. What would you do differently to get better results if you repeated the experiment? Do not comment on your lab skills but on the steps of the method.

	Beginning	Developing	Accomplished	Exemplary
Hypothesis	No variables identified includes hypotheses in incorrect format	variables are partially identified or identified incorrectly includes hypothesis in "If…then…" format with limited reasoning	variables are correctly identified includes and describes hypothesis in "If…then…" format using scientific reasoning	variables are correctly identified and described includes and explains hypothesis in "If…then…" format using correct scientific reasoning
Data Table	Lots of data is missing	Some data is included while some is missing and/or incorrect	Most data neatly and correctly included	All data neatly and correctly included.
Analysis Questions	Data is interpreted Validity of the hypothesis is stated Only 1 positives and negatives stated about the method. Improvements to the method are stated	Data is interpreted and results are explained Validity of the hypothesis is assessed and outlined using scientific reasoning. A minimal list of positives and negatives about the method Improvements to the method that would benefit the scientific investigation are outlined.	Data is accurately interpreted and results are explained using scientific reasoning Validity of the hypothesis is assessed and described using scientific reasoning. A list of positives and negatives about the method. Improvements to the method that would benefit the scientific investigation are described	Data is correctly interpreted and results are explained using correct scientific reasoning Validity of the hypothesis is assessed and explained using scientific reasoning. A detailed list of positives and negatives about the method. Improvements to the method that would benefit the scientific investigation are explained.