EXPERIMENT DESIGN

	Expectation:	5	4	3	2	1
Hypothesis/Prediction	A properly formatted hypothesis/prediction includes an identification of the experimental (independent) variable and a brief description of how it will affect the dependent variable. It should also include a logical rationale why the dependent variable will be affected in that way.	clear, properly formatted, complete hypothesis with rationale	clear, properly formatted, complete hypothesis	somewhat clear, properly formatted, complete hypothesis	unclear and/or improperly formatted hypothesis	no hypothesis or prediction provided
Variables	The independent and dependent variables must BOTH be clearly identified.	independent (manipulated) and dependent (responding) variables clearly identified	X	either independent or dependent variable clearly identified	X	neither independent nor dependent variable clearly identified
Procedure	A complete procedure explains the experimental design, apparatus used, and how the experiment was done. DO NOT write this section as though it were a series of directions in a lab activity. (ex. "First pour agar into six petri dishes. Then inoculate the dishes with the bacteria. Then put the plates into the incubator.") DO simply describe how the experiment was done. (ex. "Six petri dishes were prepared with agar and inoculated with bacteria. The plates were incubated for ten hours.") The data collection process must be incorporated into the procedure as well. Also, a reference to repetitions - or data aggregation with other data sets - must be a part of the procedure. Extraneous or unnecessary information should be excluded. (ex. "Gather materials" or "Clean up" or "Turn on electronic balance") Personal pronouns, or any reference to the lab group, should NOT be present.	clear, step-by-step procedure; data collection properly explained; repetitions included	mostly clear, step-by-step procedure; data collection properly explained; repetitions included	mostly clear, step-by-step procedure; data collection properly explained; no clear reference to repetitions	mostly clear, but incomplete procedure; data collection improperly explained; no clear reference to repetitions	confusing, incomplete procedure; data collection missing; no clear reference to repetitions

Measurements / Observations	In the procedure, an exact, clear description of the measurements and/or observations to be made must be present. What type of data will be collected, how it will be collected, for how long and how often it will be collected, and how it may be manipulated is necessary. (ex. "Measure the height of the plant to the nearest centimeter using a metric ruler. Measure from the point the seedling emerges from the soil to the highest point of the plant. Measurements will be taken ever day for a 2-week period. The data collected will be averaged with other measurements taken from groups with like treatments.")	clear explanation of measurements/ observations to be made and how; how often and for how long	clear explanation of measurements/ observations to be made and how; how often to be made	somewhat clear explanation of measurements/ observations to be made; how often to be made	somewhat clear explanation of measurements/ observations to be made	no clear reference to what or how measurements or obervations will be made
Controls	At least THREE controlled variables must be identified in the procedure. Often times, scientific experiments have many more controlled variables, so more can be included to highlight a stronger understanding of the procedure.	at least three controlled variables clearly identified	two controlled variables clearly identified	only one controlled variable identified	no controlled variables identified	varibles identified are not controlled ones

TABLE

		5	4	3	2	1
Title	There should be a clear, complete, and appropriate title.	clear, appropriate title	somewhat clear, appropriate title	X	no clear and appropriate title	no title
Labels	All of the columns (vertical sets) and rows (horizontal sets) should be properly and clearly labeled.	all columns and rows properly and clearly labeled	most columns and rows properly and clearly labeled	some columns and rows labeled, somewhat clearly	labels on columns and rows are unclear	no columns or rows labeled
Units	Correct and appropriate units must be included for both the columns and the rows.	units clearly included for columns and rows	units somwehat clearly included for columns and rows	units only clear for columns OR rows	units present, but unclear for both columns AND rows	units missing for both columns and rows
Data	The data recorded in the table must be clear, complete, and appropriate.	data recorded is clear, complete, and proper	data recorded is somewhat clear, complete, and proper	data recorded is somewhat clear, somewhat complete, and proper	data recorded is unclear and/or incomplete	most data missing or improperly recorded

GRAPH

		5	4	3	2	1
Title	A graph's title should be a short description of the data being illustrated by it. (ex. "The Effect of Light Intensity on the Growth Rate of Soybean Seedlings") Both the independent and dependent variables are part of a proper graph title. However, "versus" titles should NEVER be used.	accurate, clear, complete, and descriptive title (no "vs")	accurate, somewhat clear, somewhat complete, and descriptive title (no "vs")	somewhat accurate, unclear, incomplete, somewhat descriptive title (no "vs")	inaccurate, unclear, incomplete, non-descript title (no "vs")	missing title, or has "vs" title
Axis Labels	Both the y- and x-axis must be properly labeled and clearly marked.	both axes have appropriate labels; clearly marked	both axes have appropriate labels; somewhat clearly marked	only one axis has a clearly marked label	both axes have labels, but are not apprpriate	both axes are missing labels
Axis Scales	Both the y- and x-axis must be properly labeled and clearly scaled. On a linear grid, the values used must increase by the same amount for each interval. The values should be clearly marked in a uniform pattern.	both axes are appropriately and clearly scaled	both axes are appropriately scaled, but only somewhat clearly	both axes are scaled, but only one is appropriately done; both are clearly done	both axes are inapprpriately scaled; one is unclearly marked	scale is missing (or practically so) on at least one axis
Axis Units	Both the y- and x-axis must be properly labeled and clearly marked with appropriate units. Without units - on either one of the axes - the graph serves no purpose.	both axes have appropriate units, clearly marked	both axes have appropriate units, somewhat clearly marked	only one axis has appropriate, clearly marked units	both axes have inappropriate units or are unclear	both axes are missing units
Data Points	Each of the data points included in the graph must be clearly marked. Those points identify to the reader what data were actually collected (or calculated). Without them, the reader may assume that at any of the infinite locations along the graph's line(s), there is a datum point that has been observed. The clear data points should either be connected with straight lines, or a trend line should be included. Sometimes, depending on the data that have been plotted, connecting the points is more appropriate, whereas a trend line should be used in other instances.	all data points clearly marked; points connected and/or trend line included	most data points marked; points connected and/or trend line included	a number of data points missing/unclear; points connected and/or trend line included	many data points missing/unclear; poor point connection or poor attempt at trend line	data points not marked or unclearly marked; no connections or lacks trend line
Legend (if necessary)	An appropriate, clear, and complete legend must be included. Without it, the graph serves no purpose.	appropriate, complete legend included	complete, but not totally clear legend included	complete, but in accurate legend	incomplete legend	legend missing

CONCLUSION

		5	4	3	2	1
Purpose	The purpose of the experiment should be stated clearly and thoroughly. NOTE: Throughout a scientific conclusion, the use of personal pronouns, and even references to one's lab group, must be avoided!	purpose of experiment stated properly, clearly, and thoroughly; avoids use of terms like "I/we/our" throughout	purpose of experiment stated properly and clearly, but incomplete; avoids use of terms like "I/we/our" throughout	purpose of experiment stated properly, but unclear and incomplete; avoids use of terms like "I/we/our" throughout	purpose of experiment stated improperly, and is unclear and incomplete	missing purpose of experiment
Hypothesis/Prediction	The original hypothesis/prediction should be clearly and accurately restated.	properly and clearly restates all parts of hypothesis or prediction	properly and clearly restates most parts of hypothesis or prediction	properly, but unclearly, restates most parts of hypothesis or prediction	improperly and unclearly restates most parts of hypothesis or prediction	missing restatement of hypothesis/prediction
Claim	A clear, accurate claim regarding the hypothesis/prediction must be made. It can either be supported or not; evidence exists or it doesn't. In some instances, it's possible that due to ambiguity in the data or observations, it's not possible to support or reject the hypothesis. No data or observations should be referenced in this statement. Terms like "prove" or "correct" or "wrong" must NOT be used. Conclusions lacking a claim altogether serve no purpose.	makes very clear, accurate claim about hypothesis/ prediction; avoids improper terms ("prove", "correct", etc.)	makes very clear, accurate claim about hypothesis/ prediction	makes somewhat clear, accurate claim about hypothesis/ prediction	makes unclear and/or inaccurate claim about hypothesis/ prediction	fails to make claim about the hypothesis/ prediction
Evidence	Relevant evidence must be included to support the claim being made about the hypothesis. The evidence could include: high and low data points, any trend(s) that are present, and possibly even objective visual observations. It is inappropriate to simply list off a series of data. Conclusions lacking evidence altogether serve no purpose.	includes high and low data points and trend for all applicable data	includes trend for all applicable data	includes trend for all applicable data, but also includes irrelevant/excess evidence	misrepresents data or provides minimal, excess, or irrelevant evidence	fails to provide any evidence

Reasoning/Rationale	Here, simply state what the data mean, and, as such, relate them directly back to the original purpose. Interpret the data in terms of any patterns that were observed, any relationships among experimental variables that are important, and any correlations between variables that are discernible. Include any explanations of how the results differed from those hypothesized, or how the results were either different from or similar to those of any other related experiments. An important component to include is the relation of the results obtained to the broader scientific concept being tested by the experiment.	properly, clearly, and completely explains validity of data; makes strong scientific connection between claim and evidence	properly, clearly, and completely explains validity of data; makes satisfactory connection between claim and evidence	somewhat clearly and completely explains validity of data; weak/missing scientific connection between claim and evidence	unclear explanation of data's validity; weak/missing scientific connection between claim and evidence	missing any reasoning and scientific connection between claim and evidence
Question(s)	Include two (or more) valid scientific questions along with rationale for choosing them. Scientific questions relate one variable to another and can be answered ONLY be testing them using proper scientific experimentation techniques. (ex. "How does the temperature at which bacteria are incubated influence their growth rate?") Improper questions include those that can simply be researched, include multiple variables, or cannot be answered by scientifically testing them. (ex. "How many different types of bacteria are there?" or "What environmental conditions do pill bugs prefer?" or "Which science class is most popular with students?")	two or more valid scientific questions provided along with appropriate reasons	two or more valid scientific questions provided	one valid scientific question provided along with an appropriate reason	one valid scientific question provided	missing any valid scientific questions

Improvement	Here, describe two or more logical, valid improvements to the experiment. These improvements should be ones that would provide more concise data addressing the hypothesis, or that would extend the understanding of the concept(s) being studied into related areas. (ex. "Since E. coli grow most quickly between 35 and 39 degrees Celsius, further testing could be done to determine a more precise temperature at which they grow.") Do NOT make any references to the experimenters' use of materials or data collection abilities. (ex. "use the microscope more carefully" or "measure the length more accurately") This would imply that materials weren't used properly and that data were collected accurately thereby bringing into question the validity of the entire conclusion. Do NOT make any references to "human error" as it would imply errors were made during the experiment and, again, question the conclusion's validitv.	two or more logical, valid experimental improvements provided along with appropriate rationale for them	two or more logical, valid experimental improvements provided	one logical, valid experimental improvement provided with appropriate rationale for it	one logical, valid experimental improvement provided	missing any logical, valid experimental improvements

SUMMARY

		5	4	3	2	1
Description	Clearly describe what you did in the activity. Do NOT simply restate the steps of the activity; summarize them in your own words. Don't include any irrelevant details (ex. Clean-up procedure, or tiny details that aren't important to the concept you studied). A summary is not a formal lab paper, so you should refer to what you and your group did, but not specifically what each person did.	describes activity very clearly and includes all important details	describes activity clearly, includes most (but not all) details	describes activity somewhat clearly, but leaves out some important details	makes attempt to describe activity, but leaves out many important details	fails to describe activity
Concept	Describe each of the concepts you studied in the activity. Some activities may focus on a single concept, while others may have multiple ones. Use the lab activity procedure to help you focus your writing about the concepts.	all scientific concepts studied are included and explained thoroughly and clearly	all scientific concepts studied are included and explained clearly	most scientific concepts studied are included and explained clearly	scientific concepts studied are incomplete and/or not explained clearly or thoroughly	scientific concepts studied are neither identified nor explained
Importance	Relate the concept(s) being studied to its/their scientific importance in biology. (ex. If the properties of water are the concepts, you should specifically describe how it's important to living things. If you're studying mitosis, you must explain how the creation of new cells is important for organisms.)	clearly and thoroughly explains scientific importance/ purpose of activity	clearly explains scientific importance/ purpose of activity	somewhat clearly explains scientific importance/ purpose of activity	makes attempt to explain scientific importance/ purpose of activity	fails to provide any scientific importance/ purpose for activity
Learned	You should thoroughly and clearly explain AT LEAST two scientific concepts or principles that YOU PERSONALLY learned. Since summaries are not part of formal lab papers, it's appropriate for you to use pronouns referencing yourself. Be sure to describe the concepts you learned, not what the group, or any other student, learned.	identifies and explains clearly at least two scientific concepts that were learned via the activity	identifies and explains clearly one scientific concept that were learned via the activity	identifies and explains somewhat clearly one scientific concept that were learned via the activity	identifies one scientific concept that were learned via the activity	does not identify any scientific concepts learned via the activity
Format	Use complete, well-written sentences to write your summary. Be sure to proof read so that there aren't any grammatical or spelling errors. Take your time to write a thorough summary that demonstrates your effort and thoughtfulness. Your writing should not appear to the reader as though you rushed through it just to get it done. Use MLA or APA format.	uses complete sentences; very easy to follow summary parts; uses MLA (or APA) formatting properly; grammar, spelling, etc. is perfect	uses complete sentences; easy to follow summary parts; uses MLA (or APA) formatting properly; grammar, spelling, etc. is good	uses complete sentences; easy to follow summary parts; not formatted properly; grammar, spelling, etc. is okay	some incomplete sentences; easy to follow summary parts; not formatted properly; grammar, spelling, etc. is okay	few (if any) complete sentences; difficult to follow summary parts; not formatted properly; grammar, spelling, etc. makes it
Terminology	Proper use of terminology is critical for the reader to determine if you truly understand what you're writing. Improper use of scientific terminology demonstrates that you do NOT know what you're talking about.	includes proper use of appropriate terminology	X	X	X	does not include proper use of appropriate terminology