Biocore FINAL PAPER Review Rubric

	0 = inadequate	1 =adequate	2 = good	3 = very good	4 = excellent
Title	Point of experiment cannot be determined by title	Has two or more problems comparable to the following: Title is not concise, point of experiment is difficult to determine by title, most key information is missing	Title could be more concise but still conveys main point of experiment; 2 or more key components are missing	Title is concise & conveys main point of experiment but 1 key component is missing	Title is concise, conveys main point of experiment, and includes these key components: study system, variables, result, & direction. [With systematic observations, results may be too preliminary to define direction so title should be more general.]
Abstract	Abstract is missing or, if present, provides no relevant information.	Many key components are missing; those stated are unclear and/or are not stated concisely.	Covers all but 2 key components and/or could be done more clearly and/or concisely.	Concisely & clearly covers all but one key component OR clearly covers all key components but could be more concise and/or clear.	Concisely & clearly covers all key components in 200 words or less: biological rationale, hypothesis, approach, result direction & conclusions
Introduction ***BIG PICTURE: Did Intro convey why experiment was performed and what is was designed to test?***	4-5 key components are very weak or missing; those stated are unclear and/or not stated concisely. Weak/missing components make it difficult to follow the rest of the paper. Often results in hypothesis that "comes out of nowhere."	Covers all but 3 key components & could be more concise and/or clear. **OR** clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* background information is not focused on a specific question and minimal biological rationale is presented such that hypothesis isn't entirely logical	Covers all but 2 key components **OR** clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* biological rationale not fully developed but still supports hypothesis. Remaining components are done reasonably well, though there is still room for improvement. Includes information that is extraneous and detracting from the main ideas.	Concisely & clearly covers all but one key component (w/ exception of rationale) **OR** clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Intro but fails to state the approach **OR** has done a nice job with Intro but has also included some irrelevant background information	Clearly, concisely, & logically presents all key components: relevant & correctly cited background information, question, biological rationale (including biological assumptions about how the system works and knowledge gap), hypothesis, approach. (There may be a few minor issues with organization/clarity.)
Methods & Materials ***BIG PICTURE: Did Methods clearly describe how hypothesis was tested?***	So little information is presented that reader could not possibly replicate experiment **OR** methods are entirely inappropriate to test hypothesis	Procedure is presented such that a reader could replicate experiment **but** methods are largely inappropriate to test hypothesis **OR** Procedure is presented such that a reader could replicate experiment only after learning several more key details**.**	Procedure is presented such that a reader could replicate experiment only after learning a few more key details **OR** methods used are reasonably appropriate for study, though a more straight-forward approach may have been taken.	Concisely, clearly, & chronologically describes procedure used so that reader could replicate *most* of experiment with the exception of a few relatively minor details. Methods used are appropriate for study. Minor problems with organization OR some irrelevant/ superfluous information.	Concisely, clearly, & chronologically describes procedure used so that knowledgeable reader could replicate experiment and understand the results. Methods used are appropriate for study. Clearly defines controls and how they will inform the experiment. Briefly describes mathematical manipulations or statistical analyses.
Results ***BIG PICTURE: Did the Results clearly & effectively display relevant data?***	Major problems that leave reader uninformed; narrative text is lacking entirely, tables & figures contain unclear and/or irrelevant information. *e.g.,* "Results" contain no text, raw data are in a table w/ poor legend.	Has 3-5 problems comparable to the following: narrative text and & tables/figures are minimal and mostly uninformative, some relevant data are present but are mixed in with much unnecessary information, trends are not immediately apparent in figures and are not explicitly noted in text, tables & figures lack legends, variation around mean values is not indicated in either text or figures, conclusions about hypothesis are emphasized.	Has presented findings with a reasonably good narrative text & informative tables/figures, but has 2-3 problems comparable to the following: most relevant data are present but are mixed in with some unnecessary information, trends are shown in figures but are not explicitly noted, tables & figures have very brief legends that leave out key details, variation around mean values is not indicated in figures, conclusions about hypothesis are briefly made.	Has presented both a concise, narrative text & informative tables/figures without biological interpretation, but has made 1-2 minor omissions or has other relatively small problems. *e.g.,* relevant data & trends are summarized well and without biological interpretation, but tables & figures have very brief legends that leave out some key details.	With a few minor exceptions, contains a concise, well-organized narrative text & tables/figures that highlight key trends/ patterns/output from statistical tests without biological interpretation. Tables & figures have appropriate legends/ labels & can stand on their own. If you have problems collecting valid data, state what the problem was that makes your data invalid.

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Discussion ***BIG PICTURE Did the Discussion present conclusions that made sense based on the data?***	4 or more key components are missing or very weakly done. *e.g.,* illogical conclusions made based on data, no ties to biological rationale are made, no literature cited, little to no evaluation of experimental design/data.	Covers all but 3 key components & could be more concise and/or clear. **OR** clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* fails to explicitly reject or support hypothesis and so conclusions are vague and incompletely tied to rationale, literature is minimally cited, presents unranked laundry list of problems instead of logical evaluation of design and data, suggests flashy new experiments that would not clearly shed light on current question.	Covers all but 2 key components **OR** clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely *e.g.,* clearly states that hypothesis is rejected or supported and develops a good argument that refers to biological rationale, but fails to logically and objectively evaluate assumptions and the experimental design and data reliability. Remaining components are done reasonably well, though there is still room for improvement.	Concisely & clearly covers all but one key component **OR** clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Discussion but fails to clearly tie biological rationale from the Intro into the conclusions made **OR** has done a nice job with the Discussion but has also included an extensive laundry list of experimental problems without discussing their impact on the conclusions. *e.g*., lacks a discussion of assumptions.	With a few minor exceptions, clearly, concisely, & logically presents all key components: supports or rejects hypothesis*, interprets/integrates data; formulates argument for conclusions referring back to biological rationale & by comparing with relevant findings in literature, introduces new literature to discuss or support findings, evaluates experimental design, evaluates reliability of data, states knowledge generated & implications of results, suggests next investigation steps, includes unique observations, and ends paper with final conclusion. *If you believe error occurred, describe what you believe happened and discuss how this impacts your ability to make conclusions about hypothesis.
Literature Cited	Background information is presented but is consistently not cited; final citation list is missing	Very few references are cited in text of paper; final citation list is largely incomplete and/or is not formatted appropriately.	References within body of paper & references in final citation list are done appropriately for the most part, but there are consistent exceptions. *e.g.,* citations are used sparingly throughout the paper when background information is presented OR there are consistent formatting errors in text and final citation list.	References within body of paper are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author using WM guidelines, but there are 1-2 exceptions. *e.g.,* citations are done well except that one or two references listed in text do not appear in the final list OR there are a few minor formatting errors in the final citation list.	References within body of paper are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author using WM guidelines.
Overall grammar, organization, wording	All poorly organized, interrupted flow to ideas leading to lack of clarity, cannot follow thought progression, many grammatical errors	Problematic organization of some section resulting in loss of clarity; awkward wording at times; some grammatical errors	Organization somewhat problematic but can still follow thought progression *e.g.* explanation of methods in the results section; wording awkward at times, some grammatical errors	Organization was good with few to no problems, wording awkward in a few places, few grammatical errors	Excellent organization and paper flow, appropriate word choice, few to no grammatical errors

Biocore RESEARCH PROPOSAL Rubric

	0 = inadequate	1 =adequate	2 = good	3 = very good	4 = excellent
Title	Point of experiment cannot be determined by title	Has two or more problems comparable to the following: Title is not concise, point of experiment is difficult to determine by title, most key information is missing	Title could be more concise but still conveys main point of experiment; 2 or more key components are missing	Title is concise & conveys main point of experiment but 1 key component is missing	Title is concise, conveys main point of experiment, and includes these key components: study system, variables, expected result, & direction
Introduction ***BIG PICTURE: Did Intro convey why the experiment will be performed and what it is designed to test?***	4-5 key components are very weak or missing; those stated are unclear and/or not stated concisely. Weak/missing components make it difficult to follow the rest of the paper. Often results in hypothesis that "comes out of nowhere."	Covers all but 3 key components & could be more concise and/or clear. **OR** clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* background information is not focused on a specific question and minimal biological rationale is presented such that hypothesis isn't entirely logical	Covers all but 2 key components **OR** clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* biological rationale not fully developed but still supports hypothesis. Remaining components are done reasonably well, though there is still room for improvement. Includes information that is extraneous and detracting from the main ideas.	Concisely & clearly covers all but one key component (w/ exception of rationale) **OR** clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Intro but fails to state the approach **OR** has done a nice job with Intro but has also included some irrelevant background information	Clearly, concisely, & logically presents all key components: relevant & correctly cited background information, question, biological rationale (including biological assumptions about how the system works and knowledge gap research addresses), hypothesis, approach. (There may be a few minor issues with organization/clarity.)
Methods & Materials ***BIG PICTURE: Did Methods clearly describe how hypothesis will be tested?***	So little information is presented that reader could not possibly replicate experiment **OR** methods are entirely inappropriate to test hypothesis	Procedure is presented such that a reader could replicate experiment **but** methods are largely inappropriate to test hypothesis. **OR** Procedure is presented such that a reader could replicate experiment only after learning several more key details**.**	Procedure is presented such that a reader could replicate experiment only after learning a few more key details**. OR** methods used are reasonably appropriate for study, though a more straight-forward approach may have been taken.	Concisely, clearly, & chronologically describes procedure to be used such that reader could replicate *most* of experiment with the exception of a few relatively minor details. Methods used are appropriate for study. Minor problems with organization OR some irrelevant/ superfluous information.	Concisely, clearly, & chronologically describes procedure to be used such that knowledgeable reader could replicate experiment and understand expected results. Methods used are appropriate for study. Clearly defines controls and how they will inform the experiment. Briefly describes mathematical manipulations or statistical analyses to be used.
Expected & Alternative Results ***BIG PICTURE: Did the Results clearly & effectively display expected data that are relevant?***	Major problems that leave reader uninformed; narrative text is lacking entirely, tables & figures contain unclear and/or irrelevant information. *e.g.,* figures are not accompanied by text, expected raw data are in a table w/ poor legend; expected results do not support proposed hypothesis.	Has 3-5 problems comparable to the following: narrative text and & tables/figures are minimal and mostly uninformative, some relevant expected data are present but are mixed in with much unnecessary information, trends are not immediately apparent in figures and are not explicitly noted in text, tables & figures lack legends, variation around mean values is not indicated in either text or figures, conclusions about proposed hypothesis are emphasized; alternative results are not mentioned.	Has presented expected findings with a reasonably good narrative text & informative tables/figures, but has 2-3 problems comparable to the following: most relevant expected data are present but are mixed in with some unnecessary information, trends are shown in figures but are not explicitly noted, tables & figures have very brief legends that leave out key details, variation around mean values is not indicated in figures, conclusions about proposed hypothesis are briefly made; alternative results are scarcely mentioned.	Has presented both a concise, narrative text & informative tables/figures without biological interpretation, but has made 1-2 minor omissions or has other relatively small problems. *e.g.,* tables & figures have very brief legends that leave out some key details.	With a few minor exceptions, contains a concise, well-organized narrative text & tables/figures that highlight anticipated key trends/ patterns/output from statistical tests without biological interpretation. Figures should present data that would support hypothesis as well as present alternative results. Tables & figures have appropriate legends/ labels & can stand on their own.

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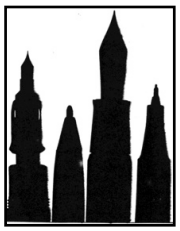
Implications ***BIG PICTURE*** ***Did the Implications present explanations of expected & alternative results that made sense based on the 'dummy' data presented?***	4 or more key components are missing or very weakly done. *e.g.,* illogical conclusions made based on predicted trend, no ties to biological rationale are made, alternative results are not mentioned, no literature cited, little to no evaluation of confidence in experimental design.	Covers all but 3 key components & could be more concise and/or clear **OR** clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* relevance of predicted trend is incompletely tied to rationale, literature is minimally cited, presents unranked laundry list of potential problems instead of logical evaluation of design and data, suggests far-reaching/ illogical ramifications of experiment.	Covers all buy 2 key components **OR** clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* clearly describes relevance of predicted trend that refers to biological rationale, but fails to logically and objectively evaluate assumptions & confidence in the experimental design **OR** has done a nice job with all the components but only briefly mentions alternative results without discussing their implications. Remaining components are done reasonably well, though there is still room for improvement.	Concisely, clearly, & logically covers all but one key components **OR** clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Implications but fails to clearly tie biological rationale from the Intro with the predicted trend **OR** has done a nice job with the Implications but has also included an extensive laundry list of potential flaws in experimental design without discussing their impact on the predicted trend or alternative results.	With a few minor exceptions, clearly, concisely, & logically presents all key components: describes relevance of predicted trend as it relates to knowledge gap and rationale, explains assumptions made, evaluates confidence in experimental design, discusses alternative results in light of incomplete biological rationale or flawed biological assumptions, and discusses ramifications of experiment.
Literature Cited	Background information is presented but is consistently not cited; final citation list is missing	Very few references are cited in text of paper; final citation list is largely incomplete and/or is not formatted appropriately.	References within body of paper & references in final citation list are done appropriately for the most part, but there are consistent exceptions. *e.g.,* citations are used sparingly throughout the paper when background information is presented OR there are consistent formatting errors in text and final citation list.	References within body of paper are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author using WM guidelines, but there are 1-2 exceptions. *e.g.,* citations are done well except that one or two references listed in text do not appear in the final list OR there are a few minor formatting errors in the final citation list.	References within body of paper are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author using WM guidelines.
Overall grammar, organization, wording	All poorly organized, interrupted flow to ideas leading to lack of clarity, cannot follow thought progression, many grammatical errors	Problematic organization of some section resulting in loss of clarity; awkward wording at times; some grammatical errors	Organization somewhat problematic but can still follow thought progression *e.g.* explanation of methods in the results section; wording awkward at times, some grammatical errors; several switches between present/past/future tense	Organization was good with few to no problems, wording awkward in a few places, few grammatical errors; a few switches between present/past/future tense	Excellent organization and paper flow, appropriate word choice, few to no grammatical errors, consistently uses future tense

Biocore Research Proposal and Final Paper Rubric Conversion to Letter Grade

The TAs use the following rubric conversion key along with the four Big Picture Questions to assign final grades to your papers. (For proposal papers, the "Results" section is replaced by the "Expected and Alternative Results", and the "Discussion" section is replaced by the "Implications" section.) Final papers include abstracts while research proposals do not.

Letter Grade	Minimum Criteria
A	"4" in at least 3 of the main sections (Intro, Methods, Results, Discussion); "4" in overall grammar, organization, wording; no less than "3" in remaining sections
AB	Does not meet minimum criteria for an "A", but has "3" or better in each of the four main sections (Intro, Methods, Results, Discussion) and in overall grammar, organization, & wording. Has a "2" or better on Title, Abstract, and Literature Cited.
B	Does not meet minimum criteria for an "AB", but has "3" or better in at least two of the four main sections (Intro, Methods, Results, Discussion) and in overall grammar, organization, & wording. Has a "2" or better on Title, Abstract, and Literature Cited.
BC	Does not meet minimum criteria for a "B", but has "2" or better in at least two of the four main sections (Intro, Methods, Results, Discussion) and in overall grammar, organization, & wording. Has a "1" or better on Title, Abstract, and Literature Cited.
C	Does not meet minimum criteria for a "BC", but has "1" or better in all four main sections (Intro, Methods, Results, Discussion) and in overall grammar, organization, & wording. Has no more than one zero in remaining sections
D	Does not meet minimum criteria for a "C", but has "1" or better in at least two of the four main sections (Intro, Methods, Results, Discussion) and in overall grammar, organization, & wording. Has no more than two zeros in remaining sections
F	Does not meet minimum criteria for a "D"



Group Effort Analysis & Tips for Writing a Group Paper

Most papers that scientists write result from the collaborative efforts of two or more researchers. There is a clear expectation that **all authors** listed on primary literature have made **significant and equitable contributions** to carrying out the research and in writing the paper itself. In other words, all authors listed should be able to independently answer "big picture" questions (*e.g.*, justification for study, conclusions about hypothesis) raised by reviewers about the work presented. We model this collaborative nature of science in Biocore by requiring students to work in teams to carry out lab research projects. We also provide a few opportunities for you to get experience writing a collaborative group paper. Here are our expectations and tips for writing group papers:

- **Group papers take longer** - Organize your team to begin writing as soon as possible.
- **Communicate regularly** -make sure everyone has the information they need and understands the scope of the task.
- **Each team member must make an equivalent contribution** - One person should not shoulder the burden of writing for the team.
- **Agree upon a common outline for the paper** - The entire team should **agree on the conclusions** made based on data collected and on **the logical argument** that will be made to support these conclusions.
- **Shoulder to Shoulder OR Divide and Conquer?** - Some teams can sit shoulder to shoulder and compose a paper together. Others find it efficient to assign **one to two people per section** (Intro, Methods etc..) followed by a **peer review** by each teammate. If you choose the latter, you need to agree as a team on the final structure and content of the paper.
- **Make it flow-** Once sections of paper have been combined and edited, the draft needs to be reviewed and revised so that it flows logically. Before submitting to your TA each person should have a final review for approval.

Group Effort Analysis (GEA) Rubric			
Criteria	**Poor**	**Good**	**Excellent**
Attendance and punctuality at meetings	Member frequently absent or late, and did not inform or contact team about absence or tardiness	Member present and on time at most meetings/lectures. When absence necessary, often informed team members and worked to resolve issues associated with absence.	Present and punctual at all meetings/ lectures and communicated if any extenuating circumstances or irregularity occurred.
Participation in data collection, data analysis	Member did not actively participate in discussion and did not contribute to group progress.	Most of the time made an attempt to understand the assignment and participates in the discussion.	Meaningfully participated in all discussions, anticipated future needs of the group, and took initiative in monitoring group progress.
Preparedness for meetings	Did not prepare prior to class/group meeting.	Most of the time prepared prior to meeting time with ideas/questions to discuss.	Came prepared for all meetings with ideas/questions to discuss.
Ability to listen to ideas/concerns of others	Did not listen to or attempted to ignore ideas or concerns of others. Consistently dominated or withdrew from discussions.	Patiently and actively listened to ideas and concerns of others, most of the time	Helped develop an atmosphere in the group where everyone's ideas and concerns are heard by modeling patient and active listening.
Ability to cooperate and/or compromise	Practiced competitive, uncooperative group behaviors that inhibited the group from achieving goals.	Worked cooperatively most of the time, and compromised to help group achieve goals.	Welcomed discussion and critique of ideas in a supportive, cooperative positive environment. Worked to overcome negative, competitive group dynamics if necessary. Encouraged group to maintain high standards of group conduct.

Participation in project planning	Member did not actively participate in discussion and did not contribute to planning project.	Made an attempt to understand the assignment and participate in the discussion.	Contributed meaningfully and participated in all discussions to plan the project.

Peer Review: Another way you will be working in groups or pairs is through peer review, which is an opportunity for you to give and receive peer feedback on your papers before you turn them in to be graded by your TA. Writing is a form of communication and a peer can tell you whether or not your paper makes sense. It is to your advantage to **take seriously your responsibility to review a peer's paper**. We find that the review process benefits the reviewer as well as the author because it gives you practice evaluating a paper applying the same criteria your TA will use to evaluate your paper. Note that you do not need to wait for us to assign a formal review to take advantage of the peer review process. You can always get together with another student and act as reviewers for each other's papers even when it is not required as part of an assignment!

Peer review is a skill that takes practice. Use the following criteria when you are learning how to peer review. In order to help you become a more skilled peer reviewer, we will ask you to hand in your peer review comments to be evaluated by your TA. Your TA will use these same criteria to evaluate your peer review.

Peer Review Rubric			
Criteria	Adequate	Good	Excellent
Focus on "Global Concerns" (larger structural, logic/reasoning issues) rather than detailed "Local Concerns" (spelling, grammar, formatting)	Does not identify missing components. Comments are restricted to spelling, grammar, formatting and general editing.	Identifies most components as present or absent. One or two global concerns comments on a paper that required more focus there. Major comments are focused at the local concerns/ editing level.	Can identify all components of paper as present or absent. Provides logical and well reasoned critique. Recognizes logic leaps and missed opportunities to make connections between parts of paper. Provides a good balance of comments addressing 'global concerns' together with minor comments addressing 'local concerns'
Thorough constructive critique including a balance* of positive and negative comments	Review is entirely positive or negative with little support or reasoning provided.	Good comments, but not balanced as positive and negative or not supported with reasoning	Supports author's efforts with sincere, encouraging remarks giving them a foundation on which to build for subsequent papers. Critical comments are tactfully written.
Evidence of thorough reading and review of paper	Comments focused on one or two distinct issues, but not on the overall reasoning and connectedness of all sections in paper. Obvious that reviewer did not read the entire paper or skimmed through to quickly to understand.	Evidence that the reviewer read the entire paper, but did not provide thorough review.	Comments on all parts of paper and connections between paper sections. Comments are clear, specific, and offer suggestions for revision rather than simply labeling a problem. Appropriate comment density demonstrates the reviewer's investment in peer review, while not overwhelming the writer.
Outlines both general and specific areas that need improvement and provides suggestions	Review is too general to guide authors revision or too specific to help author on subsequent papers	Provides both general and specific comments but no suggestions on how to improve.	Supplies author with productive comments, both general and specific, for areas of improvement. General comments are those that authors may use in subsequent papers, whereas specific comments pertain to the specific paper topic and assignment. Comments come with suggestions for improvement.

Biocore Oral Presentation Rubric

	0 = inadequate	1 = adequate	2 = good	3 = very good	4 = excellent
Content	Team's presentation was missing 4-5 key components; those stated were unclear and/or were not stated concisely.	Team clearly, concisely, & thoroughly conveyed all but 3 key components and could be more concise and/or clear OR clearly covers all but 2 key components but those presented could have been done much more clearly, concisely, and/or thoroughly.	Team clearly, concisely, & thoroughly conveyed all but two key components OR clearly covers all but one key component but could have been presented more clearly, concisely and/or thoroughly.	Team clearly, concisely, & thoroughly conveyed all but 1 key component OR clearly covers all key components but could be more concise and/or clear. *e.g*., clearly & thoroughly conveyed all key components but could have been more concise.	With a few minor exceptions, the team clearly, concisely, & thoroughly conveyed their research project such that the audience could grasp & evaluate the work. The presentation contained all of these key components: 1. a clear, logical biological rationale summarizing research goals, key concepts, unfamiliar terminology, & knowledge gaps to be addressed, referencing appropriate literature; 2. concise, complete hypothesis statement; 3. clear explanation of methods, particularly those unfamiliar to audience; 4. comprehensible graph(s) of results (or expected results); 5. clear & logical conclusions based on data (or expected data) & implications; 6. summary of assumptions that were supported or incorrect and any relevant problems/errors. 7. Audience questions after the presentation were answered logically and fully.
Organization	The presentation content was not logically organized and so did not facilitate the audience's comprehension.	Only some of the presentation content was logically organized, and so many key clarifications were necessary after the presentation.	Most of the presentation content was logically organized, but some key clarifications were necessary after the presentation.	The presentation content was logically organized so that only a few minor clarifications were necessary after the presentation.	With a few minor exceptions, the presentation content was logically organized in a way that facilitated the audience's comprehension.
Teamwork	No teamwork was evident.	Teamwork was not effective because none of the three criteria was fully met.	Teamwork was somewhat effective; 1 of the 3 criteria was fully met.	Teamwork was largely effective; 2 of the 3 criteria were fully met.	Effective teamwork contributed to the success of the presentation because it met these criteria: 1. each team member's contribution to the presentation was equivalent; 2. each team member contributed answers to questions asked after the presentation, to the best of their ability; 3. teammates were respectful of each speaker and did not interrupt them.
Visuals	The visuals used satisfied only 1-2 of the key criteria.	The visuals used satisfied all but 4-5 of the key criteria.	The visuals used satisfied all but 2-3 of the key criteria.	The visuals used satisfied all but one of the key criteria.	With a few minor exceptions, the visuals accompanying the oral narrative very effectively conveyed the research project because they satisfied these criteria: 1. content was relevant; 2. overall appearance was pleasing to the eye but did not distract from the research; 3. font size, graphs, & figures were large enough to be viewed easily; 4. font, graph, & figure *colors contrasted well against background & so were easy to see; 5. content (text, graphics) filled with just enough information to be informative without looking overcrowded; 6. graphs and figures were clearly labeled, had titles (no legends necessary), and effectively displayed relevant data/trends; 7. organization & formatting emphasized pertinent points. *colors optional
Presentation Mechanics	The presentation mechanics satisfied only 1-2 of the key criteria.	The presentation mechanics satisfied all but 5-6 of the key criteria.	The presentation mechanics satisfied all but 3-4 of the key criteria.	The presentation mechanics satisfied all but one to two of the key criteria.	With a few minor exceptions, the presentation mechanics allowed the research project to be very effectively conveyed because they satisfied these criteria: 1. the rate, flow, and clarity of delivery by each speaker was appropriate; 2. all speakers were introduced; 3. each speaker's voice was loud enough to be heard in the back of the room; 4. each speaker spoke to the audience in a narrative style, avoiding distracting mannerisms; 5. transitions between speakers were smooth and helped audience follow the presentation; 6. graph & figure axes labeling were explained clearly before trends/results were emphasized; 7. content was presented long enough to allow audience to follow easily; 8. presentation ended with final conclusion statement(s); 9. presentation took 15 +/- 1 min. (varies w/ assignment).

Biocore Oral Presentation Rubric Conversion to Letter Grade

Letter Grade	Minimum Criteria
A	Team earned a “4” in Content and Organization, earned a “3” or better in Teamwork, Visuals, and Presentation Mechanics.
AB	Team did not meet minimum criteria for an “A”, but earned a “3” or better in Content and Organization. Earned a “2” or better in Teamwork, Visuals, and Presentation Mechanics.
B	Team did not meet minimum criteria for an “AB”, but earned a “2” or better in Content and Organization. Earned a “2” or better in Teamwork, Visuals, and Presentation Mechanics.
BC	Team did not meet minimum criteria for a “B”, but earned a “2” in Content and a "1" in Organization OR vice versa. Earned a "1" or better in Teamwork, Visuals, and Presentation Mechanics.
C	Team did not meet minimum criteria for a “BC”, but earned a “1” or better in Content and Organization. Received no more than one zero in Teamwork, Visuals, and Presentation Mechanics.
D	Team did not meet minimum criteria for a “C”, but earned a “1” or better in either Content or Organization. Received no more than two zeros in Teamwork, Visuals, and Presentation Mechanics.
F	Team did not meet minimum criteria for a “D.”

Biocore FINAL POSTER Review Rubric

	0 = inadequate	1 =adequate	2 = good	3 = very good	4 = excellent
Title	Answer to study question cannot be determined by title	Has two or more problems comparable to the following: Title is not concise, answer to study question is difficult to determine by title, most key information is missing	Title could be more concise but still conveys answer to study question. OR Title is concise & conveys answer to study question but has problem similar to the following: missing model system & independent variable	Title is concise & conveys answer to study question, but has problem similar to the following: is missing model system or independent variable	Title is concise; gives reader idea of experimental system; states organism/system studied, independent variable, and direction of results.
Introduction	4-5 key components are very weak or missing; those stated are unclear and/or not stated concisely. Introduction provides little to no relevant information. Often results in a hypothesis that "comes out of nowhere."	Covers all but 3 key components & could be more concise and/or clear OR clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely (excessive text, overly wordy). Weak/missing components make it difficult to follow the rest of the poster. *e.g.,* background information not focused on study question & minimal biological rationale presented such that hypothesis isn't entirely logical.	Covers all but 2 key components OR clearly covers all but 1 key component but could be done more logically, clearly, and/or concisely. *e.g.,* biological rationale not fully developed but still supports hypothesis. Remaining components are done reasonably well, though there is still room for improvement; includes info that is extraneous & detracts from the main ideas; multiple examples of wordy text.	Concisely & clearly covers all but one key component (w/ exception of rationale) **OR** clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Intro but fails to state hypothesis concisely **OR** has done a nice job with Intro but has also included some irrelevant background information	Clearly, concisely, & logically presents all key components often in diagram or conceptual model: relevant & correctly cited background information, study question biological rationale (including main biological assumptions about how system works as well as knowledge gap), hypothesis. (There may be a few minor issues with organization/clarity.)
Methods & Materials	So little information is presented that reader could not possibly evaluate claims	Methods presented such that a reader would have difficulty evaluating claims unless they learned several more key details **OR** methods are conveyed with too much text & almost no figures/charts.	Methods presented such that a reader could evaluate *most* claims made only after learning a few more key details **OR** methods are conveyed with a lot of text & would be better explained with more figures/charts.	Concisely & clearly describes procedures used to generate data so that reader could evaluate *most* claims made. Minor problems with organization OR some irrelevant/ superfluous info.	Concisely & clearly describes procedures used to generate data presented, giving readers enough information to evaluate claims but not necessarily to repeat experiment. Uses brief text and/or annotated diagram(s) and/or charts with detailed legends to convey experimental design, tools, sequence of events, data transformation and statistical tests used.
Results	Major problems that leave reader uninformed; narrative text is lacking entirely, tables & figures contain unclear and/or irrelevant information. *e.g.,* raw data are in a table w/ poor legend and no title.	Has 3-5 problems comparable to the following: excessive narrative text with minimal, uninformative tables/figures /tables; some relevant data are present but are mixed in with much unnecessary information; key data are not immediately apparent in figures and are not explicitly noted in text, tables & figures lack legends and/or titles, conclusions about hypothesis are emphasized; overuse of text.	Uses somewhat concise text to refer to figures/graphs/tables that highlight the data, but has 2-3 problems comparable to the following: most relevant data are present but are mixed in with some unnecessary information, key data are shown in figures but are not explicitly noted, tables & figures have very brief legends that leave out key details, conclusions about hypothesis are briefly made; overuse of text paragraphs.	Uses very concise text to refer to figures/graphs/tables that highlight the data, but has made 1-2 minor omissions or has other relatively small problems. *e.g.,* relevant data are summarized well and without biological interpretation, but tables & figures have very brief legends that leave out some key details.	With a few minor exceptions, uses prominent figures/ graphs/tables that highlight the data and very concise text and/or bullets to describe general trends and emphases. Only relevant data are shown, including the controls. Utilizes images and statistical tests appropriately. Tables & figures have informative legends & titles.

	0 = inadequate	1 =adequate	2 = good	3 = very good	4 = excellent
Discussion	4 or more key components are missing or very weakly done. *e.g.,* illogical conclusions made based on data, no ties to biological rationale are made, no literature cited, little to no evaluation of experimental design/data.	Covers all buy 3 key components & could be more concise and/or clear OR clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* fails to conclude anything about the hypothesis and so conclusions about study question are vague and incompletely tied to rationale, literature is minimally cited, presents unranked laundry list of problems instead of logical evaluation of data, suggests flashy new experiments that would not clearly address study question.	Covers all but 2 key components OR clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* clearly states that hypothesis is supported and develops a good argument that refers to biological rationale, but fails to logically and objectively evaluate the data reliability or propose next investigative steps. Remaining components are done reasonably well, though there is still room for improvement.	Concisely & clearly covers all but one key component OR **c**learly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Discussion but fails to clearly tie biological rationale from the Intro into the conclusions made **OR** has done a nice job with the Discussion but has also included an extensive laundry list of experimental problems without discussing their impact on the conclusions.	With a few minor exceptions, clearly & concisely presents an analysis that: supports or rejects hypothesis*, discusses biological meaning and relevance of results & compares with relevant findings in literature, evaluates experimental design, evaluates reliability of data, states implications of results, suggests next investigation steps and unexpected observations. Poster ends with final conclusion that addresses study goal/question. *If you believe some data were invalid and/or biological assumptions were not met, discuss how this impacts your confidence in the data and ability to make conclusions regarding your hypotheses.
Visuals & Organization	The organization & visuals used satisfied only 1-2 of the key criteria. Very few visuals presented.	The organization & visuals used satisfied all but 4-5 of the key criteria. Text used instead of relevant, informative visual on multiple occasions.	The organization & visuals used satisfied all but 2-3 of the key criteria. Text used instead of relevant, informative visual on 1-2 occasions.	The organization & visuals used satisfied all but one of the key criteria.	With a few minor exceptions, the organization & visual look of the poster effectively conveyed the research project because: 1. content was relevant & accurate; 2. overall layout was pleasing to the eye but did not distract from the research; 3. font size, graphs, & figures were large enough to be easily read 4. font, graph, & figure *colors contrasted well against background & so were easy to see; 5. poster filled with just enough information to be informative without looking overcrowded and/or text heavy; 6. graphs and figures were clearly labeled and effectively displayed relevant data; 7. organization & formatting emphasized pertinent points; 8. lists, diagrams, or other visuals communicate points instead of wordy paragraphs
Literature Cited	Background information is presented but is consistently not cited; final citation list is missing	Very few references are cited in text of poster; final citation list is largely incomplete and/or is not formatted appropriately.	References within body of poster & in final citation list are done appropriately for the most part, but there are consistent exceptions. *e.g.,* citations used sparingly throughout the poster when background information is presented OR consistent formatting errors in text & list.	References within body of poster & in final citation list are done appropriately, but there are 1-2 exceptions. *e.g.,* citations are done well except that one or two references listed in text do not appear in the final list OR there are a few minor formatting errors in the final list.	References within body of poster are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author or numerically using Writing Manual guidelines.
Overall grammar, wording	Poorly worded, interrupted flow of ideas leading to lack of clarity, cannot follow thought progression, many grammatical errors. Multiple examples of text overuse.	Problematic wording of some section resulting in loss of clarity; awkward wording at times; some grammatical errors. Some instances of text overuse.	Wording somewhat problematic but can still follow thought progression *e.g.* explanation of methods in the results section; wording awkward at times (clarity issues), some grammatical errors. A few minor instances of text overuse.	Wording was good with few to no problems, wording awkward in a few places, few grammatical errors. A few minor instances of text overuse	Excellent concise wording and text flow, appropriate word choice, few to no grammatical errors.

Biocore FINAL POSTER Rubric Conversion to Letter Grade

Letter Grade	Minimum Criteria
A	Earned a "4" in at least 3 of the main sections (Introduction, Methods & Materials, Results, Discussion, and Visuals & Organization) and "3" in the remaining sections; no less than a "3" in Title, Literature Cited, and Overall grammar, wording
AB	Did not meet minimum criteria for an "A", but earned a "3" or better in Introduction, Methods & Materials, Results, Discussion, Visuals & Organization. Earned a "2" or better in Title, and Literature Cited, Overall grammar, wording
B	Did not meet minimum criteria for an "AB", but earned a "3" or better in at least two of the main sections (Introduction, Methods & Materials, Results, & Discussion) and "2" in the remaining sections. Earned at least a "3" in Visuals & Organization. Earned a "2" or better in Title, Literature Cited, Overall grammar, wording.
BC	Did not meet minimum criteria for a "B", but earned a "2" or better in at least two of the main sections (Introduction, Methods & Materials, Results, &Discussion) and "1" in remaining sections. Earned at least a "2" in Visuals & Organization, and Overall grammar, wording. Earned a "1" or better in Title, Literature Cited.
C	Did not meet minimum criteria for a "BC", but earned a "1" or better in Introduction, Methods & Materials, Results, Discussion, Visuals & Organization, and Overall grammar, wording. Has no more than one zero in Title, and Literature Cited.
D	Did not meet minimum criteria for a "C", but earned a "1" or better in at least 3 of these sections: Introduction, Methods & Materials, Results, Discussion, Visuals & Organization. Has no more than two zeros in Title, and Literature Cited, and Overall grammar, wording.
F	Did not meet minimum criteria for a "D."

Biocore PROPOSAL POSTER Rubric

	0 = inadequate	1 =adequate	2 = good	3 = very good	4 = excellent
Title	Answer to study question cannot be determined by title	Has two or more problems comparable to the following: Title is not concise, answer to study question is difficult to determine by title, most key information is missing	Title could be more concise but still conveys answer to study question. OR Title is concise & conveys answer to study question but has problem similar to the following: missing model system & independent variable	Title is concise & conveys answer to study question, but has problem similar to the following: is missing model system or independent variable	Title is concise; conveys main point of experiment and includes these key components states organism/system studied, independent variable, and direction of expected results.
Introduction ***BIG PICTURE:*** *Did Intro convey why the experiment will be performed and what it is designed to test?*	4-5 key components are very weak or missing; those stated are unclear and/or not stated concisely. Introduction provides little to no relevant information. Often results in a hypothesis that "comes out of nowhere."	Covers all but 3 key components & could be more concise and/or clear OR clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely (excessive text, overly wordy). Weak/missing components make it difficult to follow the rest of the poster. *e.g.,* background information not focused on study question & minimal biological rationale presented such that hypotheses aren't entirely logical.	Covers all but 2 key components OR clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* biological rationale not fully developed but still supports hypotheses. Remaining components are done reasonably well, though there is still room for improvement; includes info that is extraneous & detracts from the main ideas; multiple examples of wordy text.	Concisely & clearly covers all but one key component (w/ exception of rationale) **OR** clearly covers all key components but could be much more concise and/or clear. *e.g.,* has done a reasonably nice job with the Intro but fails to state hypotheses concisely **OR** has done a nice job with Intro but has also included some irrelevant background information	Clearly, concisely, & logically presents all key components often in a diagram or conceptual model: • relevant & correctly cited background information • study question • biological rationale which links treatment to expected results at cellular/molecular level • hypotheses that are testable given experimental design (There may be a few minor issues with organization/clarity.)
Methods & Materials ***BIG PICTURE:*** *Did the methods clearly describe how hypotheses will be tested?*	So little information is presented that reader could not possibly evaluate claims	Methods presented such that a reader would have difficulty evaluating claims unless they learned several more key details **OR** methods are conveyed with too much text & almost no figures/charts.	Methods presented such that a reader could evaluate *most* claims made only after learning a few more key details **OR** methods are conveyed with a lot of text & would be better explained with more figures/charts.	Concisely & clearly describes proposed procedures so that reader could evaluate *most* claims made. Minor problems with organization OR some irrelevant/ superfluous info.	Concisely & clearly describes proposed procedures used to generate expected data, giving readers enough information to evaluate whether protocol is appropriate to test hypothesis but not necessarily to repeat experiment. Uses brief text and/or annotated diagram(s), schedule and/or charts with detailed legends to convey experimental design, tools, sequence of events, data transformation and statistical tests to be used.

Expected and Alternative Results **BIG PICTURE:** *Did the expected results clearly & effectively display expected data that are relevant?*	Major problems that leave reader uninformed; narrative text is lacking entirely, tables & figures contain unclear and/or irrelevant information. *e.g.,* figures are not accompanied by text, expected raw data are in a table w/ poor legend & no title; expected results do not support proposed hypothesis.	Has 3-5 problems comparable to the following: excessive narrative text with minimal, uninformative tables/figures/tables; some relevant expected data are present but are mixed in with much unnecessary information, key data are not immediately apparent in figures and are not explicitly noted in text, tables & figures lack legends and/or titles, conclusions about proposed hypotheses are emphasized; alternative results are not mentioned.	Uses somewhat concise text to refer to figures/graphs/tables that highlight the data, but has 2-3 problems comparable to the following: most relevant expected data are present but are mixed in with some unnecessary information, key data are shown in figures but are not explicitly noted, tables & figures have very brief legends that leave out key details, conclusions about proposed hypothesis are briefly made; alternative results are scarcely mentioned.	Uses very concise text to refer to figures/graphs/tables that highlight expected & alternative data, but has made 1-2 minor omissions or has other relatively small problems. e.g. relevant expected data are summarized well & without biological interpretation, but tables & figures have very brief legends that leave out some key details.	With a few minor exceptions, uses very concise text and/or bullets to refer to series of figures/ graphs/tables that highlight the expected data. Only relevant expected and alternative data are shown, including the controls. Utilizes images & statistical tests appropriately. Tables & figures have informative legends & titles.
Implications **BIG PICTURE** *Did the Implications present explanations of expected & alternative results that made sense based on the 'dummy' data presented?*	4 or more key components are missing or very weakly done. *e.g.,* illogical conclusions made based on predicted data, no ties to biological rationale are made, alternative results are not mentioned, no literature cited, little to no evaluation of confidence in experimental design.	Covers all but 3 key components & could be more concise and/or clear OR clearly covers all but 2 key components but could be done much more logically, clearly, and/or concisely. *e.g.,* relevance of predicted trend is incompletely tied to rationale, literature is minimally cited, presents unranked laundry list of potential problems instead of logical evaluation of design and data, suggests far-reaching/ illogical ramifications of experiment.	Covers all but 2 key components OR clearly covers all but 1 key component but could be done much more logically, clearly, and/or concisely. *e.g.,* clearly describes relevance of predicted data that refers to biological rationale, but fails to logically and objectively evaluate confidence in the experimental design **OR** has done a nice job with all the components but only briefly mentions alternative results without discussing biological relevance.	Concisely & clearly covers all but 1 key component OR clearly covers all key components but could be more concise and/or clear. *e.g.,* has done a reasonably nice job with the Implications but fails to clearly link the biological rationale from the Intro with the expected results **OR** has done a nice job with the Implications but has also included an extensive laundry list of potential flaws in experimental design without discussing their impact on the predicted or alternative results.	With a few minor exceptions, clearly, concisely and logically presents all key components: describes relevance of predicted trend as it relates to background information, rationale, explains assumptions made, evaluates confidence in experimental design, discusses alternative results in light of incomplete biological rationale or flawed biological assumptions, and discusses ramifications of the experiment. If there are anticipate problems in collecting valid data, stated what the problem is and how it may limit confidence or result in alternative data.
Visuals & Organization	The organization & visuals used satisfied only 1-2 of the key criteria. Very few visuals presented.	The organization & visuals used satisfied all but 4-5 of the key criteria. Text used instead of relevant, informative visual on multiple occasions.	The organization & visuals used satisfied all but 2-3 of the key criteria. Text used instead of relevant, informative visual on 1-2 occasions.	The organization & visuals used satisfied all but one of the key criteria.	With a few minor exceptions, the organization & visual look of the poster effectively conveyed the research project because: 1. content was relevant & accurate; 2. overall layout was pleasing to the eye but did not distract from the research; 3. font size, graphs, & figures were large enough to be easily read; 4. font, graph, & figure *colors contrasted well against background & so were easy to see; 5. poster filled with just enough information to be informative without looking overcrowded and/or text heavy; 6. graphs and figures were clearly labeled and effectively displayed relevant data; 7. organization & formatting emphasized pertinent points; 8. lists, diagrams, or other visuals communicate points instead of wordy paragraphs.

Literature Cited	Background information is presented but is consistently not cited; final citation list is largely incomplete and/or is not formatted appropriately.	Very few references are cited in text of poster; final citation list is largely incomplete and/or is not formatted appropriately.	References within body of poster & in final citation list are done appropriately for the most part, but there are consistent exceptions. *e.g.,* citations used sparingly throughout the poster when background information is presented OR consistent formatting errors in text & list.	References within body of poster & in final citation list are done appropriately, but there are 1-2 exceptions. *e.g.,* citations are done well except that one or two references listed in text do not appear in the final list OR there are a few minor formatting errors in the final list.	References within body of poster are cited appropriately; references in final citation list are formatted appropriately and listed alphabetically by author or numerically using Writing Manual guidelines.
Overall grammar & wording	Poorly worded, interrupted flow of ideas leading to lack of clarity, cannot follow thought progression, many grammatical errors. Multiple examples of text overuse.	Problematic wording of some section resulting in loss of clarity; awkward wording at times; some grammatical errors. Some instances of text overuse.	Wording somewhat problematic but can still follow thought progression *e.g.* explanation of methods in the results section; wording awkward at times (clarity issues), some grammatical errors. A few minor instances of text overuse.	Wording was good with few to no problems except in a few places, few grammatical errors. A few minor instances of text overuse	Excellent concise wording, grammar, and flow, appropriate word choice, few to no grammatical errors.

Biocore Proposal Poster Rubric Conversion to Letter Grade

Letter Grade	Minimum Criteria
A	Earned a "4" in at least 3 of the main sections (Introduction, Methods & Materials, Expected & Alternative Results, Implications, and Visuals & Organization) and "3" in the remaining sections; no less than "3" in Title, Literature Cited, and Overall grammar, wording.
AB	Did not meet minimum criteria for an "A", but earned a "3" or better in: Introduction, Methods & Materials, Expected & Alternative Results, Implications, Visuals & Organization. Earned "2" or better in Title and Literature Cited, and Overall grammar, wording.
B	Did not meet minimum criteria for an "AB", but earned a "3" or better in at least two of the main sections (Introduction, Methods & Materials, Expected & Alternative Results, Implications) and "2" in remaining sections. Earned at least "3" in Visuals & Organization; "2" or better in Title and Literature Cited, and Overall grammar, wording.
BC	Did not meet minimum criteria for a "B", but earned a "2" or better in at least two of the main sections (Introduction, Methods & Materials, Expected & Alternative Results, Implications). Earned at least "2" in Visuals & Organization, and Overall grammar, wording. Earned a "1" or better in Title, Literature Cited.
C	Did not meet minimum criteria for a "BC", but earned a "1" or better in Introduction, Methods & Materials, Expected & Alternative Results, Implications, Visuals & Organization. Has no more than one zero in Title, Literature Cited, and Overall grammar, wording.
D	Did not meet minimum criteria for a "C", but earned a "1" or better in at least 3 of these sections: Introduction, Methods & Materials, Expected & Alternative Results, Implications, Visuals & Organization. Has no more than two zeros in Title, Literature Cited, and Overall grammar, wording.
F	Did not meet minimum criteria for a "D."