Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Advisor Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (8) | Marginal (6) | Unacceptable (2) |
| **Introduction: Context**  Demonstrates a clear understanding of the “big picture”.   * Why is this question important/ interesting in this field? * What do we already know? * What problem/ question is this research addressing? | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Introduction: Accuracy and relevance**   * Content knowledge is accurate, relevant, thorough and provides appropriate background for reader including defining critical terms   NOTE: Websites or review papers are not primary references | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Hypotheses: Testable and consider alternatives**   * Hypotheses are clearly stated, testable and consider plausible alternative explanations. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Hypotheses: Scientific merit**   * Hypotheses have scientific merit. * Predictions are given using operational definitions | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Methods: Controls and replication**   * Appropriate controls (including appropriate replication) are present and explained. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Methods: Experimental design**   * Experimental design is likely to produce salient and fruitful results, and is explicitly related to their predictions (tests the hypotheses posed.) * Methods description is thorough enough to allow for replication by others. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Results: Data Selection & Presentation**   * Data are comprehensive, accurate and relevant. * Data are summarized in a logical format (e.g., table, graphs, or diagrams) | | | | | |
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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (8) | Marginal (6) | Unacceptable (2) |
| **Results: Statistical Analysis**   * Statistical analysis is appropriate for hypotheses tested and appears correctly performed and interpreted with relevant values reported and explained. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Discussion: Conclusions based on data selected**   * Conclusion is clearly and logically drawn from data provided * A logical chain of reasoning from hypothesis to data to conclusions is clearly and persuasively explained. * Conflicting data, if present, are adequately addressed. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Discussion: Alternative explanations**   * Alternative explanations are considered and clearly eliminated by data in a persuasive discussion. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Discussion: Limitations of design**   * Limitations of the data and/or experimental design and corresponding implications discussed | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Discussion: Significance of research**   * Paper gives a clear indication of the significance of the research and its future directions (future research questions). | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Use of Primary Literature**   * Relevant and reasonably complete discussion of how this research project relates to others’ work in the field (scientific context provided)   *Primary literature is defined as:*   * Peer reviewed * Reports original data * Authors are people who collected the data * Published by a non-commercial publisher | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Writing quality**   * Grammar, word usage and organization facilitate the reader’s understanding of the paper. | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |
| **Independence & Self-Motivation**   * Independence or leadership in project from experimental design to data analysis | | | | | |
|  | 10 | 9 | 8 | 6 | 2 |

Students are expected to score a minimum of Satisfactory in all categories

For purpose of assigning letter grade use the following scale:

A: 100 – 90%

B: 89 – 80%

C: 79 – 70%

D: 69 – 60%

F: <60%

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Introduction: Context** | | | | | |
| Demonstrates a clear understanding of the “big picture”.   * Why is this question important/ interesting in this field? * What do we already know? * What problem/ question is this research addressing? | * The writer provides a **compelling** **argument** as to why this knowledge may be of value to other researchers in that field. * The writer describes the current gaps in our understanding of this field and provides **compelling reasons** as to how this research will help fill those gaps. | * The writer provides a **clear sense** as to why this knowledge may be of interest to other researchers in that field. * The writer describes the current gaps in our understanding of this field and **explains** how this research will help fill those gaps. | * The writer provides **one explanation** of why others would find this topic interesting. * The writer provides **some relevant context** for the research question(s). | * The writer provides a **generic or vague rationale** for the importance of the question. * The write provides **vague or generic references** to the broader context of neuroscience. | * The importance of the question is **not addressed.** * How the question relates within the broader context of neuroscience is **not addressed.** |
| **Introduction: Accuracy and relevance** | | | | | |
| * Content knowledge is accurate, relevant and provides appropriate background for reader including defining critical terms * NOTE: Websites or review papers are not primary references | * Background information is **completely accurate and thorough**. * Background information has the appropriate level of specificity to provide **useful context to aid the reader’s understanding**. * Primary literature references are relevant, adequately explained, and **indicates a reasonable literature search**. | * Background is accurate, but may contain **minor omissions**, but which do not detract from the major point of the paper. * Background information has the appropriate level of specificity to provide relevant context. * Primary literature references are **relevant and adequately explained**, but few are included. | * Background may contain **omissions or inaccuracies that do not detract** from the major point of the paper. * Background information has the **appropriate level of specificity** to provide relevant context. * Primary literature is **inadequately explained**. | * Background **omits information or contains inaccuracies** which detract from the major point of the paper. * Background information is **overly narrow or overly general** (only partially relevant). * Primary literature, if present, are inadequately explained and **contain website or secondary references**. | * Background is **missing** or contains major inaccuracies. * Background information is accurate, but **irrelevant or too disjointed** to make relevance clear. * Primary literature references are **absent or irrelevant**. May contain website or secondary references. |

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Hypotheses: Testable and consider alternatives** | | | | | |
| * Hypotheses are clearly stated, testable and consider plausible alternative explanations. | * A comprehensive **suite of testable hypotheses** are clearly stated which, when tested, **will distinguish between major factors or potential explanations** for the phenomena at hand. | * **Multiple relevant, testable hypotheses** are clearly stated. Hypotheses **address more than one major potential mechanism**, explanation or factors for the topic. | * A **single relevant, testable hypothesis** is clearly stated. The hypothesis may be compared with a “null” alternative which is usually just the absence of the expected result. | * A clearly stated, but **not testable hypothesis** is provided. * A clearly stated, but **trivial hypothesis** is provided. | * **No hypothesis** is indicated. * The hypothesis is stated but **too vague or confused** for its value to be determined. |
| **Hypotheses: Scientific merit** | | | | | |
| * Hypotheses have scientific merit. | * Hypotheses are **novel, insightful, or actually have the potential to contribute useful new knowledge** to the field. | * Hypotheses **indicate an integration of material** provided within the course and outside resources. | * Hypotheses **indicate a level of understanding beyond the material directly provided** to the student in the lab handout or lecture. | * Hypotheses are **plausible and appropriate** though likely or clearly taken *directly* from course material. | * Hypotheses are **trivial, obvious, incorrect or completely off topic** |

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Methods: Controls and replication** | | | | | |
| * Appropriate controls (including appropriate replication) are present and explained. | * Controls consider *all* relevant factors. * Controls have become **methods of differentiating between multiple hypotheses**. * Replication is **robust** (sample size is larger than average for the type of study). * **Explanations of why these controls matter** to the experiment are thorough, clear and **tied into sections on assumptions and limitations**. | * Controls **consider *all* relevant factors**. * Controls are **capable of differentiating between 2** or more hypotheses. * Replication is appropriate (**sample size is larger than average** for the type of study). * **Evidence of a reasonable sense of why controls/ replication matter** to this experiment. * Explanations are **accurate** | * Controls **takes most relevant factors into account**. * Controls include **positive and negative controls** if appropriate. * **Replication is appropriate** (average sample size with reasonable statistical power). * **Explanations of controls and/or replications are vague**, indicating only some understanding of the need for controls and/or replication. | * Controls **consider one major relevant factor**. * **Replication is modest** (weak statistical power). * **Explanations** of controls and/or replication are **inaccurate or indicate a rudimentary sense of the need** for controls and/or replication. | * Controls and/or replication are **nonexistent**. * Controls and/or replication may have been present, but just **not described** * Controls and/or replication were **described but inappropriate**. * Student **fails to mention controls and/or replication** or the explanation is **incomprehensible**. |
| **Methods: Experimental design** | | | | | |
| * Experimental design is likely to produce salient and fruitful results (tests the hypotheses posed.) * Methods are explicitly related to the hypothesis and predictions * Methods description is thorough enough to allow for replication by others. | * Appropriate with rationale as to selection choices. * Clearly explained. * A synthesis of multiple previous approaches or an entirely new approach. * **Images provided greatly enhance the reader’s understanding** of the experimental approach. | * Appropriate. * Clearly explained. * **A synthesis of multiple previous approaches** or an entirely new approach. * **Some images are provided** to assist in understanding experimental execution. | * Appropriate. * **Clearly** explained. * **Modified from coursework** in appropriate places. * Or **drawn directly from a novel source** (outside the course). * Images provided, if any, are **minimally helpful in understanding the experiment**. | * **Appropriate**. * Poorly explained. * **Drawn directly from the coursework**. * **Not modified** where appropriate. * **No images** are included. | * **Inappropriate.** * **Poorly explained/ indecipherable**. |

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Results: Data Selection & Presentation** | | | | | |
| * Data are comprehensive, accurate and relevant. * Data are summarized in a logical format (e.g., table, graphs, or diagrams) | * Data are relevant, accurate, comprehensive, and represented through **clear & appropriate figures**. * Reader can fully evaluate validity of writer’s conclusions and assumptions. * Data is **synthesized or manipulated in a novel way** to provide additional insight. | * Data are relevant, accurate and **comprehensive**. * Reader **can fully evaluate** validity of writer’s conclusions and assumptions. | * Data are **relevant, accurate and complete** with any gaps being minor. * Reader **can satisfactorily evaluate** whether the hypotheses were supported or rejected with the data provided. | * **At least one relevant dataset per hypothesis** is provided but some necessary data are missing or inaccurate. * Reader **can satisfactorily evaluate some but not all** of writer’s conclusions. | * Data are **too incomplete or haphazard** to provide a reasonable basis for testing the hypothesis. |
| **Results: Statistical Analysis** | | | | | |
| * Statistical analysis is appropriate for hypotheses tested and appears correctly performed and interpreted with relevant values reported and explained. | * Statistical analysis is **appropriate, correct and clearly explained**. * Includes a **description of what constitutes a significant value and why that value was chosen** as the threshold (may choose values beyond p<0.05) | * Appropriate descriptive & inferential (comparative) statistical analysis is **properly performed and reasonably well explained**. * **Explanation of significant value may be limited** or rote (ex. use of p<0.05 only) | * **Appropriate, correct descriptive & inferential statistics** are provided, but **lack sufficient explanation** | * Appropriate, accurate **descriptive statistics only** are provided. * Inferential statistics are provided but **either incorrectly performed or interpreted or an inappropriate test** was used. | * **No statistical analysis** is performed. * Statistics are provided but are **inappropriate, inaccurate or incorrectly performed** or interpreted so as to provide no value to the reader. |

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Discussion: Conclusions based on data selected** | | | | | |
| * Conclusion is clearly and logically drawn from data provided * A logical chain of reasoning from hypothesis to data to conclusions is clearly and persuasively explained. * Conflicting data, if present, are adequately addressed. | * Conclusions are **completely justified** by data. * Connections between hypothesis, data and conclusions are **comprehensive and persuasive**. * Conclusions **address and logically refute or explain conflicting data**. * **Synthesis of data** in conclusion may generate new insights | * Conclusions are **clearly and logically drawn from and bounded by the data** provide with no gaps in logic. * A **reasonable and clear chain of logic** from hypothesis to data to conclusions is made. * Conclusions **attempt to discuss or explain conflicting or missing data**. | * Conclusions have **some direct basis in the data**, but may contain some gaps in logic or data or are overly broad. * Connections between hypothesis, data and conclusions are **present but weak**. * Conflicting or missing data are poorly addressed. | * Conclusion have **little basis in data** provided. * Connections between hypothesis, data and conclusions are **vague or otherwise insufficient** to allow reasonable evaluation of their merit. * Conflicting or missing data are **poorly addressed**. | * Conclusions have **no basis in data** provided. * Connections between hypothesis, data and conclusions are **non-existent**. * Conflicting data are **not addressed**. |
| **Discussion: Alternative explanations** | | | | | |
| * Alternative explanations are considered and clearly eliminated by data in a persuasive discussion. | * Have become a suite of **interrelated hypotheses that are explicitly tested** with data. * Discussion and analysis of alternatives is **based on data, complete and persuasive** with a single clearly supported explanation remaining by the end of the discussion | * Some alternative explanations are tested as hypotheses; those not tested are **reasonably evaluated** in discussion. * Discussion of alternatives is **reasonably complete, uses data where possible and results in at least some alternatives being persuasively dismissed**. | * Alternative explanations are mentioned but **not discussed or eliminated** by data | * Alternative explanations are **trivial or irrelevant**. | * Alternative explanations are **not provided**. |
| **Discussion: Limitations of design** | | | | | |
| * Limitations of the data and/or experimental design and corresponding implications discussed | * Limitations are presented as factors modifying the author’s conclusions. * Conclusions **take these limitations into account**. | * Limitations are presented **as factors modifying the author’s conclusions**. | * Limitations are discussed are relevant, but **not addressed in a comprehensive way**. | * Limitations are discussed in a **trivial way** (ex. ‘human error’ is the major limitation involved) | * Limitations are **not discussed**. |
| **Discussion: Significance of research** | | | | | |
| * Paper gives a clear indication of the significance of the research and its future directions (future research questions). | * Future directions are salient, plausible and insightful. * Writer clearly explains how work fills gaps in knowledge & **new questions/opportunities that are opened up** as a result of this work. | * Future directions are **salient, plausible and insightful**. * Writer **clearly explains how this work fills our knowledge gaps**. | * Future directions are useful but **indicate incomplete knowledge** of the field (suggests research already done or is improbable). * Significance **demonstrates only partial knowledge** of field. | * Future directions are **vague, implausible** (not possible with current technologies or methodologies), **trivial or off topic**. * Mentions of significance are **vague or inappropriate** | * Future directions are **not addressed**. * Significance of the project is **not addressed**. |

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| **Category & Criteria** | Outstanding (10) | Good (9) | Satisfactory (7) | Marginal (5) | Unacceptable (0) |
| **Use of Primary Literature** | | | | | |
| * Relevant and reasonably complete discussion of how this research project relates to others’ work in the field (scientific context provided)   *Primary literature is defined as:*   * Peer reviewed * Reports original data * Authors are people who collected the data * Published by a non-commercial publisher | * Primary literature references **indicate an extensive literature search** was performed. * Primary literature references frame the question in the introduction by **indicating the gaps in current knowledge** of the field. * Primary literature references are used in the discussion to **make connections** between the writer’s work and other research in the field clear. * Primary literature references are properly and accurately cited. | * Primary literature references are more extensive (at least one major citation for each concept). * Literature cited is **predominately (>90%) primary literatures**. * Primary literature references are used primarily to provide background information and context for conclusions. * Primary literature references are properly cited. | * Primary literature references are **more extensive** (at least one major citation for each concept). * Literature cited is mainly **(>50%) primary literatures**. * Primary literature references used provide some background information and context for conclusions. * Primary literature references are **properly cited**. | * Primary literature references are **limited** (only 1-2 primary references in the whole paper). * References to the textbook, lab handout, or websites may occur. * Citations are at least **partially correctly formatted**.   NOTE: proper format includes a one-to-one correspondence between in-text and end of text references) as well as a citation style currently used by a neuroscientific, or discipline-specific journal. | * Primary literature references are **not included** |
| **Writing quality** | | | | | |
| * Grammar, word usage and organization facilitate the reader’s understanding of the paper. | * **Correct** grammar and spelling. * Word usage **facilitates reader’s understanding**. * Informative subheadings **significantly** aid reader’s understanding. * A clear organizational strategy is present with a logical progression of ideas. There is **evidence of an active planning** for presenting information; the paper is easier to read than most | * Grammar and spelling have **few mistakes**. * Word usage is **accurate** and aids the reader’s understanding. * Distinct sections of the paper are delineated by **informative subheadings**. * A clear organizational strategy is present with a **logical progression of ideas**. | * Grammar and spelling **mistakes do not hinder the meaning** of the paper. * General word usage is appropriate, although **use of technical language may have occasional mistakes**. * Subheadings are used and **aid the reader somewhat**. * There is some **evidence of an organizational strategy** though it may have gaps or repetitions. | * Grammar and spelling errors detract from the meaning of the paper. * Word usage is frequently confused or incorrect. * Subheadings are **vague and overly general**. * Information is presented in a format which **suggest lack of an organizational strategy**. | * Grammar and spelling **errors detract from the meaning** of the paper. * Word usage is **frequently incorrect or irrelevant**. * Subheadings are **not used**. * Information is presented in a **haphazard way**. |

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| **Autonomy & Self-Motivation** | | | | | |
| * Independence or leadership in project from experimental design to data analysis | * **Demonstrates ownership** of research question, experimental design and data collection * Seeks **consultation** with PI other team members without prompting * **Works collaboratively** to exceed or meet deadlines | * Demonstrates **leadership** of project in experimental design and data collection & analysis * Consistently communicated with PI and other team members * Meets **all deadlines** without prompting | * May receive research question from PI, but **collects experimental data** * Meets **most deadlines** with occasional prompts | * Receives research question from PI and relies upon others for **most data** collection * **Occasional communication** with PI * Meets **some but not all deadlines** but only with prompting | * **Relies upon others** for research question and all data collection * **Lack of communication** with PI * Repeated fails to make deadlines |